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Suitability of Montana for the HIGH PLAINS COOPERATIVE PROGRAM

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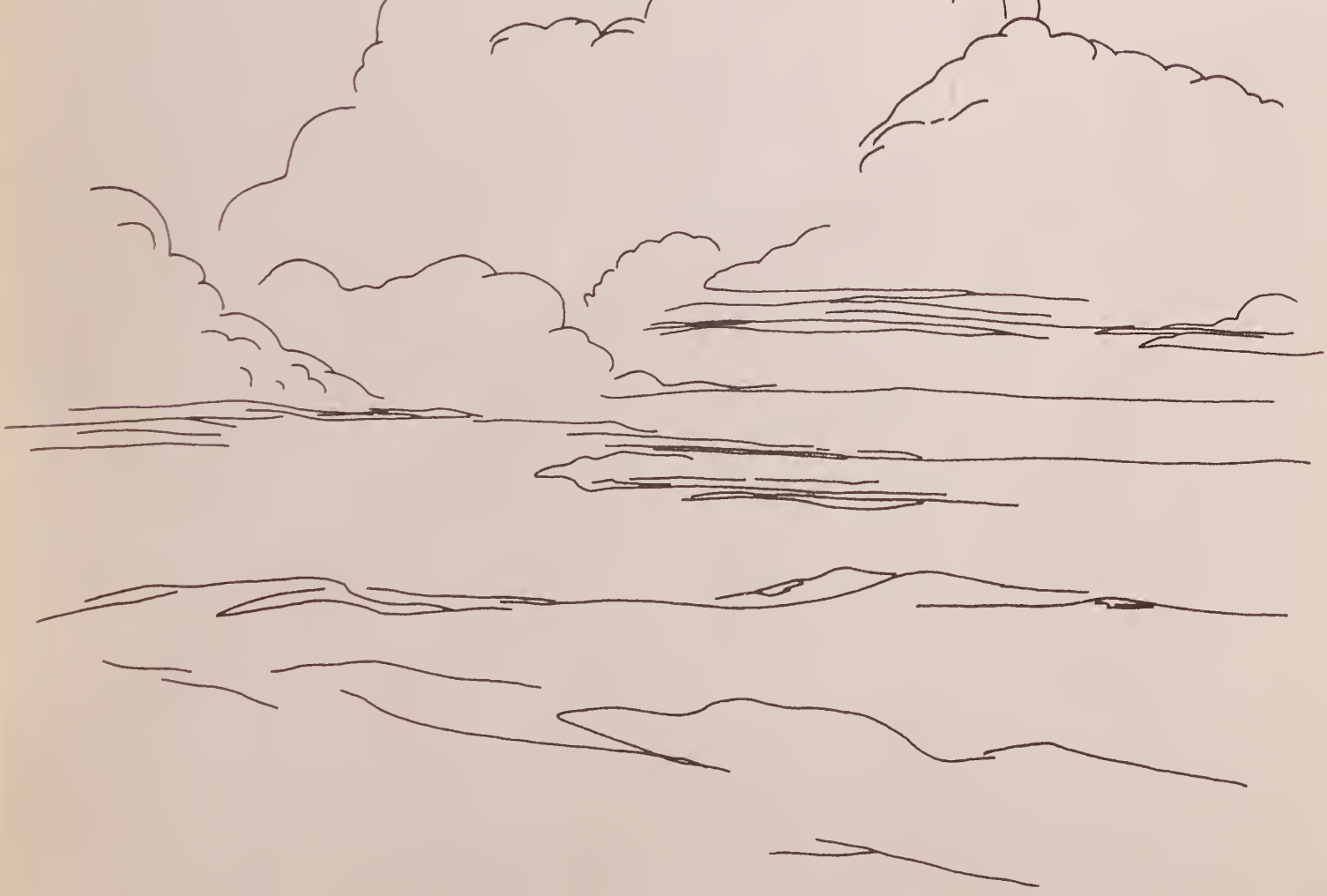

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THOMAS L. JUDGE
GOVERNOR

March 4, 1974

Dr. Archie Kahan, Chief
Division of Atmospheric Water
Resources Management
U. S. Department of Interior
P. O. Box 25007
Building 67, Denver Federal Center
Denver, Colorado 80225

Dear Dr. Kahan:

Montana has considerable potential for weather modification research and the High Plains Cooperative Program. The following analysis provides in-depth appraisal of Montana's suitability.

The study has revealed a high degree of public awareness and concomitant broad public support, which have resulted in part from the informational meetings associated with preparation of the suitability report. However, much of the awareness and support has eminated from an intensive, long-term informational program conducted by scientists at Montana State University.

In addition to local support, I can assure full cooperation at the state level. In the event a Montana test site is chosen, $100,000 in cost-sharing funds will become available for the program. Half of this amount will be derived from state funds; the other half has been committed by the Montana Wheat Research and Marketing Committee. Currently, I am looking into the possibility of continuing state support for the program.

The potential Montana test sites have all the requisite support facilities for an intensive weather modification research operation. Additionally, specialists in state government and the University System have the necessary expertise to assist with the experimental design and the conduct of the various studies.

The analysis of climatology and other environmental factors has shown that our selection of potential research sites is highly representative of the arid northern plains region, and the need for weather modification research in this region is evident. The fact that agriculture, our largest industry, is often faced with critically water-short years illustrates the need for additional beneficial water supplies. The High Plains research will determine whether weather modification is an appropriate means to provide such supplies.

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Montana remains strongly committed to the High Plains Program. We are hopeful that a field test facility will be sited in our state and that we can become more involved in this significant research undertaking.

Sincerely,

THOMAS L. JUDGE
Governor

cc: Mr. Gary J. Wicks

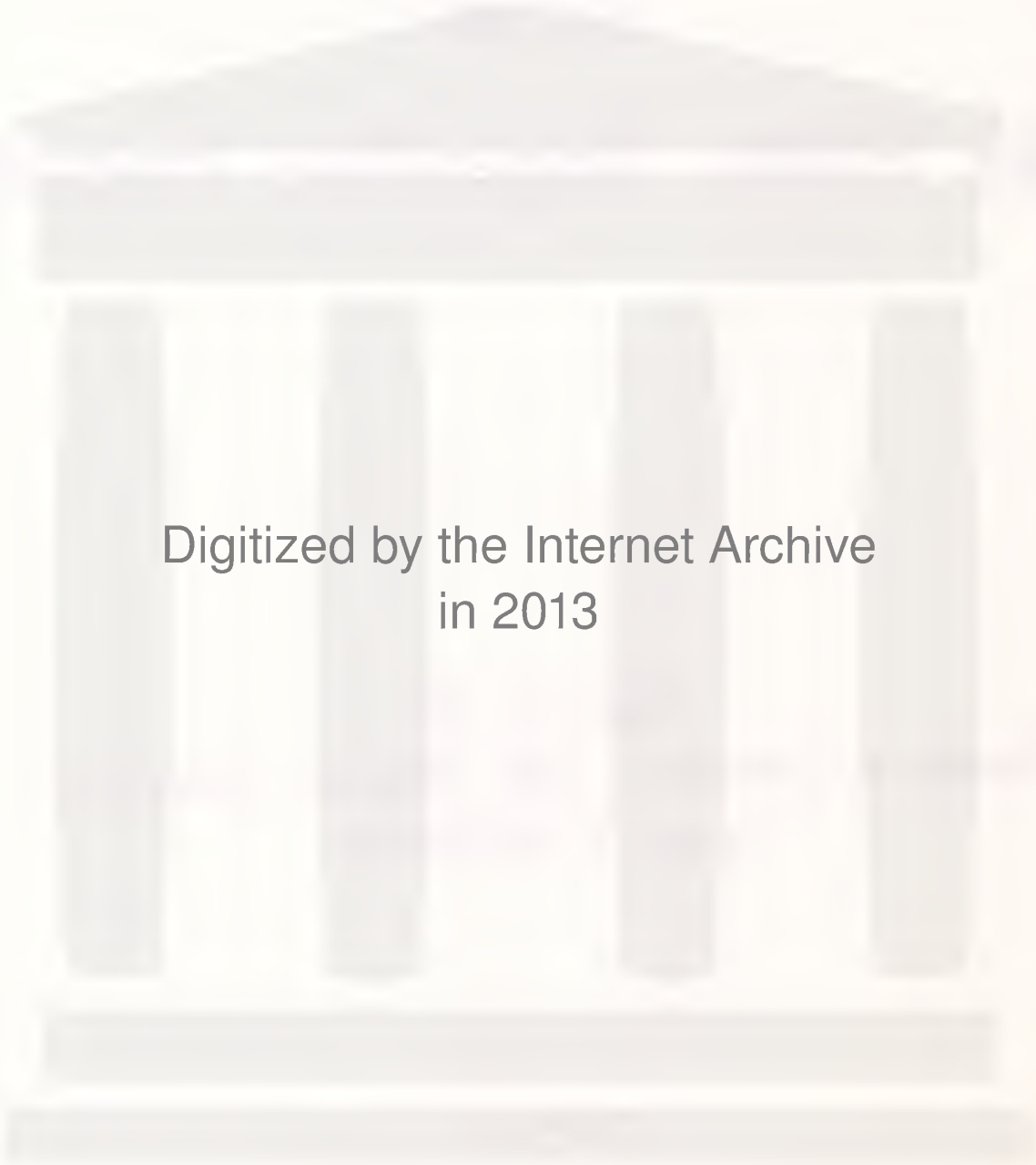
Suitability of Montana for the High Plains Cooperative Program

Report to the
Division of Atmospheric Water Resources Management
Bureau of Reclamation

Prepared by

Montana Department of Natural Resources and Conservation
and
Montana State University

FEBRUARY, 1974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PREFACE

The following report upon the suitability of Montana for the High Plains Cooperative Project is the culmination of a several year program of the Montana Department of Natural Resources and Conservation and Montana State University. This effort began as a statewide endeavor to inform local residents of the problems and prospects of summer cloud seeding programs. The most recent thrust has involved a broad assessment of public attitude toward weather modification as well as basic suitability factors of this state for the High Plains research effort.

Results of these undertakings have indicated that Montanans are well-informed of the current status of summer cloud seeding. Additionally, a high proportion of the population is in accord with the basic goals and objectives of the program. This support has recently been affirmed by the Montana Legislature in House Joint Resolution 53, and the Montana Congressional Delegation has likewise demonstrated interest and support for the High Plains effort, as evidenced by the attached letter to Interior Secretary Morton.

The accompanying report is intended to facilitate a review of Montana as a potential candidate for a High Plains field test facility. The report illustrates the need for summer weather modification research and its significance to the state. Further, it is shown that the necessary support and scientific facilities are available within Montana, that the state is highly representative of the northern high plains, and that cooperative support is assured. The suitability analysis demonstrates that this state is committed to the High Plains Cooperative Program and that Montana is most appropriate for the northern plains field research facility.

Gary J. Wicks

GARY J. WICKS, DIRECTOR
MONTANA DEPARTMENT OF NATURAL
RESOURCES AND CONSERVATION

HOUSE JOINT RESOLUTION NO. 53

INTRODUCED BY AAGESON, TIERNEY, GUNDERSON, STEPHENS, KUENZKENS, H. HARPER, COLBERG, KOLSTAD, MURPHY, HOLTZ, JACOBSEN, MANUEL

A JOINT RESOLUTION OF THE SENATE AND THE HOUSE OF REPRESENTATIVES OF THE STATE OF MONTANA RECOGNIZING THE POTENTIAL IMPACT OF SUMMER WEATHER MODIFICATION ON MONTANA'S WATER RESOURCES, ENVIRONMENT, AGRICULTURAL INDUSTRY AND ECONOMY, AND ENDORSING RESEARCH EFFORTS TO BETTER UNDERSTAND THIS TECHNOLOGY AND ITS IMPACTS.

WHEREAS, the modification of weather during the summer growing season is an infant technology in need of intensive research concerning hail suppression and rainfall augmentation, and

WHEREAS, under the high plains cooperative program, the U.S. bureau of reclamation is in the process of selecting sites for intensive research into summer cloud seeding within the arid high plains region, and associated agricultural, environmental, social and economic consequences, and

WHEREAS, specific knowledge is needed concerning the potential agricultural, environmental, economic and social impacts of summer weather modification programs, and

HJR 0053/02

WHEREAS, accelerated programs of weather modification in neighboring states, downriver water shortages of streams with headwaters in the mountains of Montana, and the potential value of hail suppression and growing season rainfall augmentation to agriculture will bring increasing pressures for operational weather modification activities in Montana,

NOW, THEREFORE, BE IT RESOLVED BY THE SENATE AND THE HOUSE OF REPRESENTATIVES OF THE STATE OF MONTANA:

That the legislature endorses and encourages efforts by state agencies, the university system and independent groups to secure a field test site within Montana for the U.S. bureau of reclamation, high plains cooperative program. Research conducted at this field test facility will significantly reduce the scientific uncertainties which surround the tecnnological aspects of summer weather modification. Additionally, such weather modification research will analyze the potential agricultural, environmental, social and economic impact upon Montana.

BE IT FURTHER RESOLVED, that cooperation of state agencies and the university system with the bureau of reclamation in the conduct of the high plains experiment in Montana would result in valuable knowledge for Montana and the region and is, therefore, desirable.

BE IT FURTHER RESOLVED, THAT A COPY OF THIS JOINT RESOLUTION BE SENT TO THE MONTANA CONGRESSIONAL DELEGATION, THE SECRETARY OF THE DEPARTMENT OF INTERIOR, AND THE DIRECTOR OF THE BUREAU OF RECLAMATION.

-End-

MIKE MANSFIELD
MONTANA

United States Senate
Office of the Majority Leader
Washington, D.C. 20510

July 30, 1973

Honorable Rogers Morton
Secretary
Department of the Interior
Washington, D. C.

Dear Mr. Secretary:

It appears that the Congress is about to grant final approval to your Department's budget request for funds for the implementation of Project Sky Water, a High Plains weather modification effort under the auspices of the Bureau of Reclamation.

In correspondence with the Department and with us, the Governor of Montana has relayed the State's strong interest in being considered as a candidate for site selection.

We wish to take this means of impressing upon you our shared support for this proposal. Montana's geographic and climatic conditions, sparse population, and agricultural needs establish it as a viable candidate. We would appreciate being kept advised as to the Department's progress in implementing Project Sky Water.

With best personal wishes, we are

Sincerely,

John Melcher
JOHN MELCHER, M.C.

Mike Mansfield
MIKE MANSFIELD, U.S.S.

Richard Shoup
RICHARD SHOUP, M.C.

Lee Metcalf
LEE METCALF, U.S.S.

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I. INTRODUCTION

The potential benefits of increasing rain during dry periods or tempering severe weather have long been obvious. However, a technology permitting partial modification of the weather has only recently developed. It was not until 1966 that the National Academy of Sciences (10) stated, "The dissipation of super-cooled ('cold') fogs and low stratus clouds over limited areas is operationally practical...." A very recent report, also from the National Academy of Sciences (11), noted, "...in the longest randomized cloud-seeding research project in the United States, involving cold orographic winter clouds, it has been demonstrated that precipitation can be increased by substantial amounts and on a determinate basis." Thus, man stands on the threshold of securing an exciting and potentially very beneficial ability - the technology to partially control the atmosphere in which he lives.

While considerable progress has been made, many important questions remain unanswered. With regard to the summer cumulus clouds producing rain showers, the National Academy of Sciences (11) concluded "...the recent demonstration of both positive and negative treatment effects from seeding convective clouds emphasizes the complexity of the processes involved. The effects indicate that a more careful search must be made to determine the seedability criteria that apply to the convective clouds over various climatic regions."

The situation relative to hailstorms is similar. The National Hail Research Experiment, currently being conducted in Colorado, should provide considerable knowledge about these damaging storms and man's ability to modify them.

Both federal and state governments and universities recognize the significant economic and social benefits that a successful growing-season rainfall augmentation technology could have on the semi-arid plains of the United States. In the Conceptual Plan for a High Plains Cooperative Program (14), it is estimated that rainfall increases of one to two inches per growing season could lead to such increases in yield per acre as 150 pounds of hay, 20 pounds of grazing forage or 2 to 3 bushels of wheat. Work recently completed at Montana State University (MSU) (2) suggests that a ten percent increase in growing-season rainfall could result in a three to eleven percent increase in small grains or a four to seven percent increase in range forage. The same interdisciplinary study estimates that a ten percent rainfall increase, applied to the plains of Montana, would yield an increase in net farm revenue of at least $10 million, and possibly as much as $43 million, per season.

II. BACKGROUND

State and federal governments have also recognized that scientific uncertainties still exist concerning summer cloud seeding. As mentioned, a national program to investigate modification of hailstorms has already begun. Now, a similar, extensive field research program into rainfall augmentation on the semi-arid High Plains is being planned. The High Plains Cooperative Program is being established by the Bureau of Reclamation in cooperation with the various Plains states. The primary goal of this research program is to establish a verified, working technology and operational management framework capable of producing additional rain from cumulus clouds by 1980.

Research is tentatively planned in three areas representing the northern, central and southern High Plains. The on-going process of selecting these three sites should be completed during March, 1974.

A conceptual plan describing a framework for the High Plains Program was distributed by the Bureau of Reclamation during May, 1973, and a conference was held in Denver during June, 1973, to review and discuss this plan. Dialogue has been subsequently maintained between the Bureau and states, local groups and individuals through correspondence and various cooperative planning meetings.

In Montana, such a meeting was held in Helena during December, 1973. Participants included representatives of the State of Montana, the Bureau of Reclamation, Montana State University, the Montana Grain Growers Association and various communities throughout the state. The decision was made to undertake a joint effort to identify and rank suitable experimental areas in Montana. Personnel from the Montana Department of Natural Resources and Conservation and Montana State University were to conduct the site selection study, and the Montana Grain Growers Association offered to pay for non-salary expenses incurred.

The first step in the selection process was to eliminate sites not meeting the minimum operational requirements as enumerated by the Bureau of Reclamation on January 22, 1974 (See Appendix A). The requirements for aircraft operations further limited consideration to areas surrounding the Montana cities of Billings, Glasgow, Great Falls and Miles City.

Letters which described the flight operations to be associated with the weather modification research program were then sent to Federal Aviation Administration (FAA) officials. The FAA was asked to comment on the degree to which each of the four cities met the experimental requirements. Their reply is included as Appendix B.

Further comment was requested from various conservation groups and state or federal agencies with a possible interest in the program. The intent of this effort was to determine the extent to which the High Plains Program might conflict with current agency operations. Additionally, the reservations and general comment of each group or agencywere sought. Correspondence received pursuant to this request is included in Appendix C.

The attitude of the residents was judged the most important criterion on which to rate the suitability of the four sites. Accordingly, a questionnaire was prepared to survey attitudes in each of the four Montana areas. A brief description of the High Plains Program and a map showing the four areas were included with the questionnaire Those documents, attached as Appendix D, were sent to officials in each of the thirty-four counties with all or part of their areas lying within a potential test area. Each potential area consists of a circle of sixty-mile radius which corresponds to the central "core" area discussed in the High Plains Conceptual Plan, and is centered at the appropriate airport. The officials notified include:

(1) County Commissioners;
(2) Mayor of towns with populations greater than 1,000;
(3) Cooperative Extension Service Agents; and
(4) Soil Conservation Service representatives.

On February 8, 1974, after the above questionnaire was distributed, a document entitled "Objective Guidelines in Area Determination - High Plains Cooperative Program" was received from the Bureau of Reclamation. This document (See Appendix E) listed eight factors which will be considered in the final experimental site selection and the weighting of each factor. These factors are listed below:

FACTOR	POINTS
1. Local research interest	20
2. State authority	10
3. Interstate coordination	10
4. Area needs	5
5. Cost sharing	15
6. Scientific facilities	15
7. Climatology	15
8. Representativeness	10

Because this rating system will be used by the Bureau of Reclamation, this report is structured to present a consideration of each of the eight factors at each of the four potential sites in Montana.

Three of the factors apply equally to all potential sites in Montana. These factors are state authority, interstate coordination, and cost sharing. The remaining five factors have been considered from two points of view; that of comparing Montana with other plains locations, and that of comparing the four potential sites within Montana.

III. DISCUSSION

A. Local Research Interest

Considerable effort has been expended during the past two years to inform Montanans about the status and potential of cloud seeding. A cooperative informational program was funded by the Montana Department of Natural Resources and Conservation and Montana State University during fiscal year 1973. Under this program, more than eighty talks on weather modification were given to groups throughout the state. In addition, various articles on weather modification were written for state newspapers and magazines, and several interviews were aired on radio and television. This program has continued on a reduced scale during fiscal year 1974 with funding provided by Montana State University.

Many groups and individuals in Montana have indicated their support for the High Plains Cooperative Program by letters, resolutions or petitions. Much of this correspondence has already been presented in such High Plains Cooperative Program publications as:

1. Conceptual Plan, May 1973 (reprint);
2. Key Correspondence through June 25-26, 1973, Bureau of Reclamation, August, 1973; and
3. Proceedings: Skywater Conference VIII, Bureau of Reclamation, October, 1973.

Although not included in this report, letters of support from the following officials or groups can be found in the above-noted Skywater reports:

State of Montana, Office of the Governor
Thomas L. Judge, Governor
United States House and Senate
John Melcher, M. C.
Richard Shoup, M. C.
Mike Mansfield, U. S. S.
Lee Metcalf, U. S. S.
Montana Department of Natural Resources and Conservation
Gary J. Wicks, Director
Economic Development Corporation of Pondera County
S. E. Henderson, President
Bear Paw Development Corporation of Northern Montana (Resolution)
Don Finley, President
Miles City Chamber of Commerce
Allen Saylor, Executive Director
Southeastern Stockgrowers Association
Walter Hope, President
Miles Community College
Vernon R. Kailey, President
City of Miles City
B. Dean Holmes, Mayor
Montana Stockgrowers Association, Inc.
Mons L. Teigen, Secretary
Montana State Rural Areas Development Committee
Torlief S. Aasheim, Chairman

Further correspondence has been received during the past few months. This correspondence is largely in support of the High Plains Program and is documented in Appendices C and F. To date there have been no letters in opposition to the overall program, although some reservations have been expressed. Among those organizations and agencies providing comment including various petitions and resolutions are:

Solicited Comments (Appendix C) - those starred have not responded.

Federal

U. S. Dept of Agriculture, Forest Service, Steve Yurich, Regional Forester
U. S. Dept. of Agriculture, Soil Conservation Service, A. B. Lindford, State Conservationist
U. S. Bureau of Land Management, Edwin Zaidlicz, State Director
U. S. Bureau of Indian Affairs, James Canan, Director

State

Department of Agriculture, George Lackman, Commissioner
Department of Fish and Game, Wesley R. Woodgerd, Director
Department of Health and Environmental Sciences, John S. Anderson, M.D., Director; Maxwell Botz, P. E., Water Quality Bureau
Department of Livestock, Glenn C. Halver, D.V.M., Administrator and State Veterinarian
Department of State Lands, Ted Schwinden, Commissioner

Organizations

League of Women Voters of Montana, Gladys Elison, President
Montana Wildlife Federation, Donald Aldrich, Executive Secretary
Montana Wilderness Association, Doris Milner, President
*Northern Plains Resources Council, Kit Muller
*Montana Stockgrowers Association, Mons Tiegen
*Western Montana Fish and Game Association, Paul Brunner
*Sierra Club, Jean A. Warren, Chairman

Unsolicited comments (Appendix F):

State

Montana Rural Areas Development Committee, Torlief S. Aasheim, Chairman
Valley County Conservation District, Raymond C. Melby, Chairman
North Valley Cooperative Grazing District, Lester J. Johnson, President

County

Glasgow Area
Valley County Commissioners, Howard Cornwell, Chairman
Great Falls Area
Liberty County Commissioners, Troy W. Lakey, Chairman
Toole County Commissioners, John G. Nesbo, Commissioner
Miles City Area
Custer County Commissioners, Victor Kosty, Chairman
Rosebud County Commissioners, Thomas A. Deveny, Chiarman, Ed McCaffree, Vice Chairman, John W. Moreland, Member

Prairie County Commissioners, Jay Fluss, Chairman
Garfield County Commissioners, Lester D. Engdahl, Chairman; John B. Jordan; Kenneth Coulter
Dawson County Commissioners, Art Dietz, Chairman; Don Gibson; Alvin Mathison
Carter County Commissioners, M.A. Markuson, Chairman

City
Glasgow Area
City Council of Glasgow, James O. Christianson, Mayor
Miles City Area
City of Forsyth, Gene Tuma, Mayor

Organizations
At large
Economic Development Association of Eastern Montana, Calvin J. Oraw, Area Community Development Agent
Glasgow Area
Glasgow Area Chamber of Commerce and Agriculture, Inc., Orville Fjeldheim, Agriculture Committee Chairman, Norris A. Forum, Executive Vice President
Montana Quality Commodities, Inc., James A. Stewart, Vice President and General Manager
Valley County Development Council, Manson Bailey, Jr., Executive Director
Valley County Farmers Education Cooperative Union of American, Montana Division, Marion Hellstern, Secretary
Tampico Farmers Union, Mrs. Chris Molvig, Secretary
Valley County Farm Bureau, Lawrence Hlad, President
Great Falls Area
Shelby Area Chamber of Commerce, Al Klinger, Secretary-Manager
Miles City Area
Economic Development Council, Wibaux County, James P. Johannes,Secretary
Economic Development Council, Wibaux County, Wayne P. Marcus, Chairman
Miles City Area Chamber of Commerce, Allen Saylor, Executive Director

Petitions
Miles City Area
156 signatures
Glasgow Area
77 signatures
177 signatures

A series of informational meetings was held in the four potential areas during the week of February 18 through 22, 1974, by personnel from Montana State University and the Montana Department of Natural Resources and Conservation. Substantial newspaper, radio and television coverage was also given the High Plains Cooperative Program during February of 1974. The meeting locations, number in attendance, results of straw votes (if any) and radio and television coverage are noted below:

Table 1: Summary of Recent Informational Programs In Montana

GENERAL AREA	SPECIFIC LOCATION	DATE	ACTIVITY	APPROX. NO. ATTENDING	STRAW VOTE* FOR	AGAINST	UNDECIDED
Billings	Billings	Feb 18	Radio and television reports				
		Feb 19	Public Informational Meeting	20	NA	NA	NA
Great Falls	Lewistown	Feb 21	Meeting	12	NA	NA	NA
	Fort Benton	Feb 21	Meeting	24	NA	NA	NA
	Chester	Feb 21	Meeting	42	NA	NA	NA
	Choteau	Feb 22	Meeting	44	42	0	2
	Great Falls	Feb 22	Meeting	20	NA	NA	NA
Glasgow	Malta	Feb 18	Glasgow area radio: 20 min. interview, 2 min "spot".				
	Malta	Feb 18	Meeting	20	17	0	3
	Wolf Point	Feb 19	Meeting	29	24	1	4
	Poplar	Feb 19	Briefed Mr. Norman Hollow, Chairman of Fort Peck Tribal Council				
	Glasgow	Feb 19	Meeting	81	80	0	1
	Glasgow	Feb 20	Meeting	60	NA	NA	NA
Miles City	Miles City	Feb 20	20 min television interview				
	Miles City	Feb 21	30 min radio interview and 2 min "spot"				
	Miles City	Feb 21	Television: 5 min. news interview				
	Miles City	Feb 21	Television: 10 min.news interview				
	Miles City	Feb 21	Public Informational Meeting	145	139	1	5

*a vote "for" indicated support of the High Plains Cooperative Program

The potential importance of weather modification for the plains of Montana has been acknowledged in the following official reports.

. Report on Resources of Eastern Montana Basins, prepared by Upper Missouri Region, Bureau of Reclamation, Aug. 1972.

Montana Situation Statement, prepared by U. S. Dept. of Agriculture, State Committee for Rural Development, Feb. 1973.

The results of the attitude survey (Appendix D) in each of the potential research areas indicate solid support for the High Plains weather modification effort. Response to the following questions is noted in Table 2 :

1. It would be most undesirable and costly to begin a research program in an area and find a growing resentment to the research. How would you rate the present attitude of county residents toward the research program described in Enclosure 1?

2. Although there is no significant evidence to link cloud seeding with excessive hail, or occurrences such as the Rapid City Flood, some individuals tend to blame weather modification for unusual weather. How would you rate the tendency of county residents to make weather modification a "scape-goat" if an unusual weather occurrence caused local damage?

3. The management of the experimental program will require the cooperation and participation of local residents, acting through their selected representatives who would meet regularly with researchers. Such meetings identify potential problems, lead to an understanding of each other's problems, and would result in the establishement of local policies concerning seeding. How would you rate the willingness of county residents to participate in such decision making?

4. It is important to know how you as an individual and community leader feel about this research. How do you rate your personal feeling about this research in your area?

Table 2: Results of the Montana Attitude Survey* toward the High Plains Cooperative Program

SITE	QUESTION 1	2	3	4	OVERALL AVERAGE	NUMBER RESPONSES RECEIVED	PERCENTAGE OF POSSIBLE RESPONSES
Glasgow	4.1	3.7	4.1	4.5	4.1	21	60
Great Falls	4.3	4.0	4.5	4.6	4.4	43	61
Miles City	3.7	3.3	4.2	4.2	3.9	40	68
Billings	3.2	3.0	4.3	4.1	3.7	18	34

*A value of 1 indicated strong disapproval,
A value of 5 indicates strong approval.

B. State Authority

The Montana Weather Modification Act of 1967 provides an excellent means to regulate cloud seeding activities within the state (see Appendix G). The Act is such that any weather modification activities which might conflict with a High Plains test facility can be carefully controlled or excluded. If a Montana site is selected for the High Plains Program, other cloud seeding efforts will assuredly be carefully regulated.

Montana law requires potential weather modifiers to obtain a license and a permit. The license requirement assures that the individual who controls a project has the necessary meteorological competence. The provision for a permit enables the expression of opinions by the public on the desirability of a particular project. Prior to issuing a permit, the Board of Natural Resources and Conservation may hold a public hearing as a means to obtain public input.

Although the Montana Act is administered by the Department of Natural Resources and Conservation, the ultimate decision concerning either a license or a permit rests with the Board of Natural Resources and Conservation and a concerned citizenry. The Board also has the authority to waive license and permit requirements for research endeavors. The coordination of all weather modification activities is the responsibility of an individual within the Department who has extensive previous experience in weather modification research.

In 1973, the Montana Legislature amended the Act to provide complete flexibility with respect to research undertakings (Sec. 89-312, R.C.M. 1947). In general, the amendments provide the Department with a legal means to enter into cooperative research agreements. Further, they enable the Department to actively participate in the planning and management of weather modification research efforts.

C. Interstate Coordination

Montana is a member of the Northern Plains Precipitation Management Committee, a working group consisting of Governors' repesentatives from the states of Montana, North Dakota, South Dakota and Wyoming. Among the accomplishments of the group is the March 1973 "Statement on Interstate Cooperation in Weather Modification in the Northern Plains" (See Appendix H). In this document, the northern plains states recognized the need for the sort of weather modification research proposed by the High Plains Program. Additionally, the Committee encouraged cooperation among the northern plains states for further research and developments of applied weather modification programs. The need for such interstate cooperation has therefore been recognized, and, when a northern plains test site is chosen, the arrangements for such an action will be formalized.

D. Area Need

With respect to average annual total precipitation, eastern and north central Montana are the driest regions of the northern high plains. Large areas often receive less than twelve inches per year (7). As a generalization, it can be noted that when wheat production is considered, yields in the eastern and north central agricultural regions are near or below the state average in bushels per acre (8).

Perhaps the need for additional water is most apparent in the Great Falls and Glasgow areas, where the acreages of unirrigated cropland are highest. The potential test areas centered at Great Falls and Glasgow each include nearly 1.5 million acres of unirrigated cropland, which is three to five times greater than at Miles City and Billings (7). The ratios of unirrigated to irrigated cropland are also high in the Great Falls and Glasgow areas. As noted in Table 7 on Page 22, ratios are eleven to one at the former and seventeen to one at the latter.

The value of water to rangeland should not be underemphasized. In the counties surrounding each potential site, rangeland varies from a low of near 3.5 million acres at Great Falls to a high of about 10.2 million acres at Glasgow. Billings and Miles City each have about 7 million acres in the surrounding counties (1).

A further need consideration relates to the Glasgow area. Valley County, in which Glasgow is situated, has been designated as a Redevelopment Area as a result of economic stress which followed the 1968 closure of Glasgow Air Force Base. On the basis of area need for water, Glasgow would appear a very favorable location. Further, any economic gains resulting from the presence of the research operation would be of considerable value to the Designated Redevelopment Area of Valley County.

E. Cost Sharing

The State of Montana's commitment to the High Plains Cooperative Program includes a willingness to provide supportive funding. Should a Montana area be selected as an intensive research site, $100.000 will be made available for the program. Approximately $50,000 could be made available from state funds; the remaining $50,000 will be provided by the Montana Wheat Research and Marketing Committee.

This financial support is intended to be used in a manner that will most effectively foster the goals and objectives of the program. Further, it is recognized that continuing financial support will provide for a more effective research endeavor. Consequently, efforts are being and will continue to be made to ensure unintermitting state financial support.

F. Scientific Facilities

Scientific expertise in weather modification in Montana exists at Montana State University in Bozeman and the U.S. Forest Service, Northern Forest Fire Laboratory at Missoula. The latter operates "Project Skyfire," an investigation of the possibilities of lightning suppression through cloud seeding. This group has extensive experience in seeding cumulus clouds and has been very cooperative in assisting MSU scientists. Mr. G. Knudsen, who coordinates weather modification activities in the Department of Natural Resources and Conservation, was associated with the Skyfire Project for several years and, thus, has considerable practical experience in weather modification.

Considerable capability exists in Montana for conducting the agricultural, economic, social, hydrologic and environmental studies needed to supplement the High Plains Cooperative Program efforts in cloud seeding.

Scientists involved in weather modification at Montana State University belong to a wide range of disciplines. For example, a study entitled "Impacts of Induced Rainfall on the Great Plains of Montana" (2) was recently completed by a team of fifteen scientists representing the fields of agriculture, geography, hydrology, sociology, economics, biology, climatology, geology and ecology. In addition, a team of chemists has worked on trace analysis of silver in precipitation as a weather modification evaluation tool. These scientists, and others at MSU, are interested in pursuing additional research into the non-meteorological aspects of summer cloud seeding.

The meteorological team at MSU has had extensive experience with weather modification experimentation. An evaluation of the Bridger Range randomized cloud seeding experiment, which was concerned with mountain snowpack augmentation, is presently being completed. The team has tested computer models of summer cumulus clouds, using field data obtained in Montana, and has investigated the feasibility of seeding cumulus clouds with ground-based generators.

The meteorology group is currently conducting an extensive diffusion experiment in eastern Montana in which silver iodide is continuously released from a high tower and tracked with aircraft. Simultaneously, the turbulence structure is monitored by fast response sensors atop the tower. The results of this study should yield considerable insight into the potential of cloud seeding with ground-based generators.

As a result of these and other activities, the meteorology group has developed considerable skill in aircraft operations (both VFR and IFR), utilization of weather radar and forecasting. They have demonstrated the capability to organize and successfully conduct field operations, and they have the equipment and personnel to undertake evaluations of weather modification programs. One member of the group (Dr. A. Super) has been certified by the Weather Modification Association.

The MSU meteorologists are quite interested in further weather modification research, especially with regard to summer cloud systems. The group would like to develop a ground-based seeding capability and a long-distance plume tracing method designed to determine whether the potential exists for seeding effects downwind of the primary target.

The Montana Agricultural Experiment Station, based at MSU, has branch stations throughout eastern Montana. Research centers are located at Huntley, Havre, Sidney and Moccasin. In addition, the U.S. Department of Agriculture and the Montana Agricultural Experiment Station cooperate in operation of the 55,000-acre Range and Livestock Experiment Station at Miles City. The Department of Agriculture's Northern Plains Soil and Water Research Center is located at Sidney. Much of the research effort at these centers is pertinent to crop, range and livestock responses to precipitation.

The Cooperative Extension Service, headquartered at MSU, would benefit from a determination of what weather modification might do toward achieving their primary goals of creating a bountiful supply of efficiently-produced food and improving the quality of rural communities. Consequently, Extension Service personnel are informing people of the current status and potential of weather modification. These professionals perform a significant service in maintaining liaison between scientists and actual users of the research results. This same function would be carried out with respect to the High Plains Cooperative Experiment if an experimental site is established in Montana.

The rapid development of the coal fields of eastern Montana is spurring research in a number of areas including reclamation, hydrologic considerations, social and economic impacts, and atmospheric dispersion. Several of these investigations can be expected to have "spin offs" that are of value to the field of weather modification and the High Plains Program. The use of silver iodide as a tracer has already been mentioned in connection with evaluation of ground-based seeding possibilities. Another example is reclamation experimentation which will increase knowledge of the response of native vegetation to precipitation amount and timing.

All four of the potential sites have weather facsimiles, Service A teletype and routine weather observations. Special note might be taken of the extensive National Weather Service facilities at Great Falls and Billings and the rawinsonde facilities at Great Falls and Glasgow.

As noted, the coal land development in southeastern Montana should spur considerable research that would be useful to the High Plains Cooperative Program. Because of proximity, this research would be most applicable to the Miles City area. This fact, together with the existence of the large Range and Livestock Experiment Station at Miles City, suggests that this area might be ranked first by the scientific facilities criterian. On the other hand, experiment stations are located reasonably near the other sites which have superior weather service facilities.

In summary, it is apparent that consideration of scientific facilities provides little with which to rank the four potential sites in Montana. The existing scientific expertise could be applied equally well to each site.

G. Climatology

The climate of eastern Montana appears to be highly suitable for weather modification research. As noted in the High Plains Conceptual Plan (14), the area compares favorably with other High Plains states in terms of number of summer days with precipitation and percentage of annual precipitation which occurs during summer.

Weinstein, in his cloud modeling study which investigated seeding potential in the western United States (17), identified Montana as the region of highest potential percentage increase (See Figure 1). Admittedly, this study has been criticized because the model used is sensitive to estimated cloud base height (12). Thus, the percentage increase figures should not be taken literally. Yet, while Weinstein conceded this point in responding to Sax, he also stated (18), "On the average, the seeding responses I calculated will occur."

If this view proves to be correct, the potential for percentage rainfall increases in Montana would be relatively high. In a region with nine to ten inches of precipitation falling during the April through September period, increases of one to two inches (ten to twenty percent) could be highly significant.

Because the High Plains Program may include preliminary studies of winter upslope storms, it is noteworthy that a recent study indicates a high frequency of seedable upslope systems in Montana (19).

The climatologies of the four potential experimental sites in Montana have been compared as part of the determination of the most suitable site or sites for summer weather modification research. The first parameter to be discussed is surface moisture.

The distribution of surface moisture among the four Montana sites is indicated in Table 3, taken from the Climatic Atlas of the United States (3). It is apparent that, of the four stations, Great Falls is consistently the driest and Miles City the wettest. The dryness at Great Falls is probably due to a combination of downslope motion and isolation from the moist air which flows northeastward from the Gulf of Mexico. Miles City has the highest frequency of moist Gulf air. The difference in moisture (dew point) between Great Falls and any other station is generally greater than the difference between any two of the other three. Table 4 shows the distribution of precipitation at each station for the months considered.

Figure 1. Potential percentage increase in precipitation due to weather modification (17).

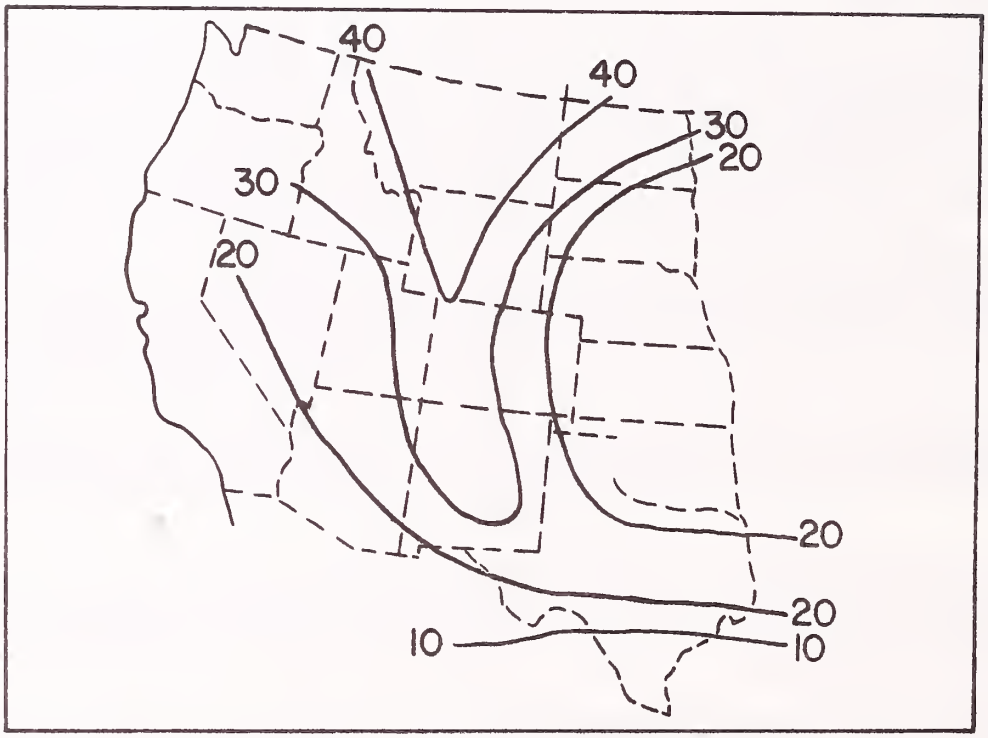

Table 3. Distribution of Surface Moisture Among the Four Montana Sites (3).

Station	Dew Point Temperatures (^{o}F) Monthly Means						Six-Month Mean	
	Apr.	May	June	July	Aug	Sept	Dew Point Temperature (^{o}F)	Mixing Ratio (g/kg)
Billings	28	38	46	48	46	38	40.7	6.0
Glasgow	25	37	45	49	44	38	39.7	5.6
Great Falls	26	34	42	44	42	36	37.3	5.3
Miles City	29	39	47	51	48	39	42.2	6.3

Table 4. Distribution of Precipitation Among the Four Montana Sites (16).

Station	Monthly Mean Precipitation in Inches (1931-1960)						Six-Month Mean in Inches
	Apr.	May	June	July	Aug	Sept	
Billings	1.31	1.88	2.55	.90	.90	1.19	8.73
Glasgow	1.01	1.49	2.98	1.33	1.49	.96	9.26
Great Falls	.98	2.10	2.90	1.28	1.26	1.20	9.72
Miles City	1.06	1.73	2.71	1.34	1.24	.96	9.04

Three-month precipitation totals at several additional stations were used to construct Figures 2 and 3 (16). It can be seen that precipitation totals are usually somewhat greater near mountainous terrain during April through June. However, during July through September, precipitation totals are greatest in extreme eastern Montana as a result of the more frequent occurrences of moist air from the Gulf of Mexico and associated convective activity.

As might be expected, gradients in precipitation are greatest near the mountains. Glasgow and Miles City, with very similar precipitation totals, are in areas with limited gradients and are therefore more typical of the plains than are Billings and Great Falls.

Table 5 is also constructed from data in the Climatic Atlas of the United States (3). While Great Falls has the largest total number of days with measurable precipitation (.01 inch or greater) and Glasgow the fewest, the minor differences are largely due to springtime precipitation.

Table 5. Mean Number of Days With Measurable Precipitation (3)

Station	Apr	May	June	July	Aug	Sept	Six- Month Totals	Six- Month Means
Billings	10	11	11	8	8	7	55	9.2
Glasgow	7	8	12	8	7	7	49	8.2
Great Falls	8	11	13	8	8	8	56	9.3
Miles City	8	10	12	8	7	7	52	8.7

A study recently completed by Montana State University meteorologists provides further insights into the climatology of the area (5). Figure 4, taken from that study, compares the amount and frequency of four precipitation types for Billings, Glasgow and Great Falls for the period extending from March through November. Miles City was not included because substantial data were missing. However, in view of the similarity of surface moisture, precipitation, average weekly precipitation probability and days with precipitation of .01 inch or more, it appears probable that Miles City would be very similar to Billings and Glasgow.

The differences in hours and amounts of steady or thunderstorm rainfall were relatively small at the three stations. However, showery rain not associated with thunderstorms was significantly different among the sites. While Great

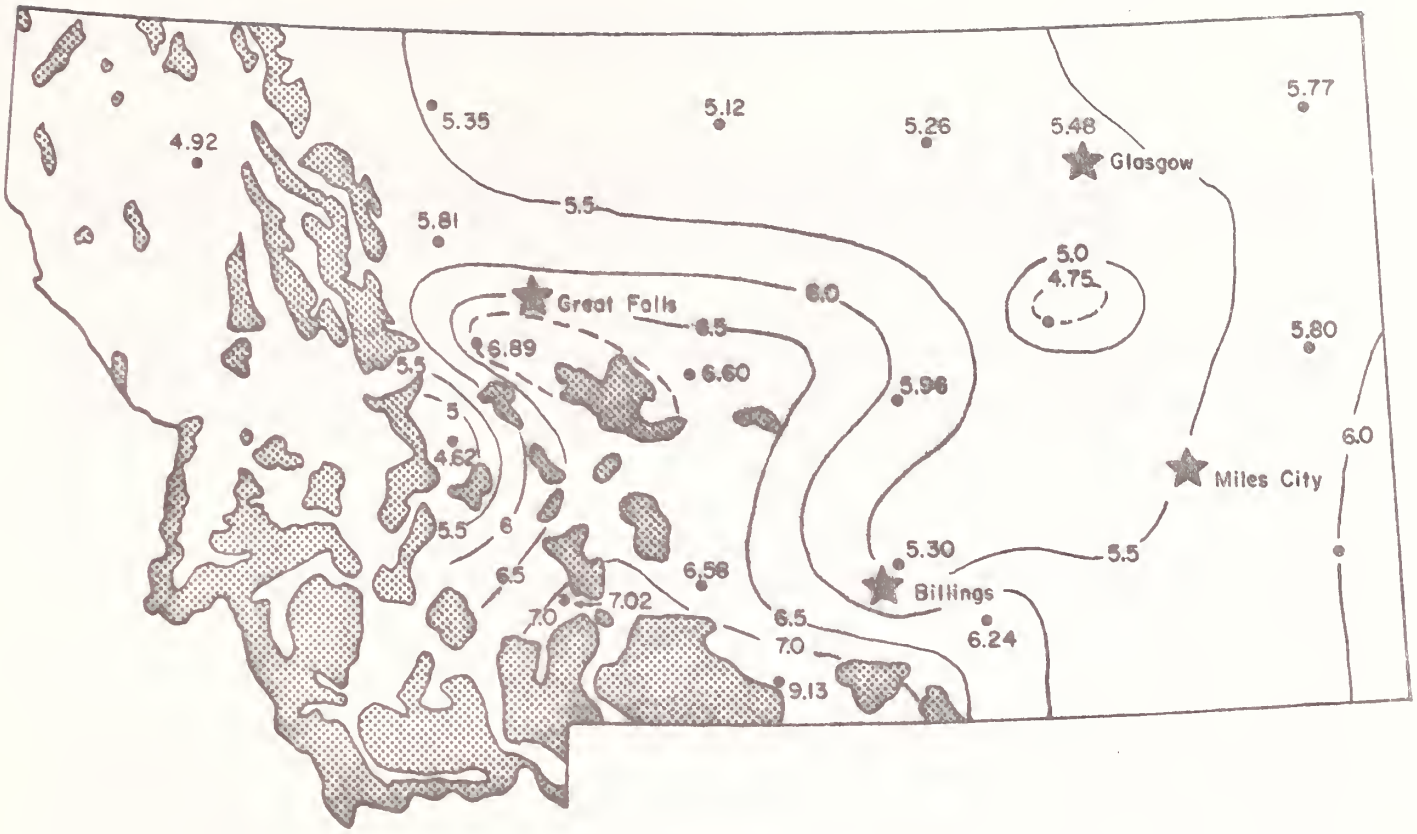

Figure 2: Three-month precipitation total for Eastern Montana. (April, May, June, 1931-1960) (16).

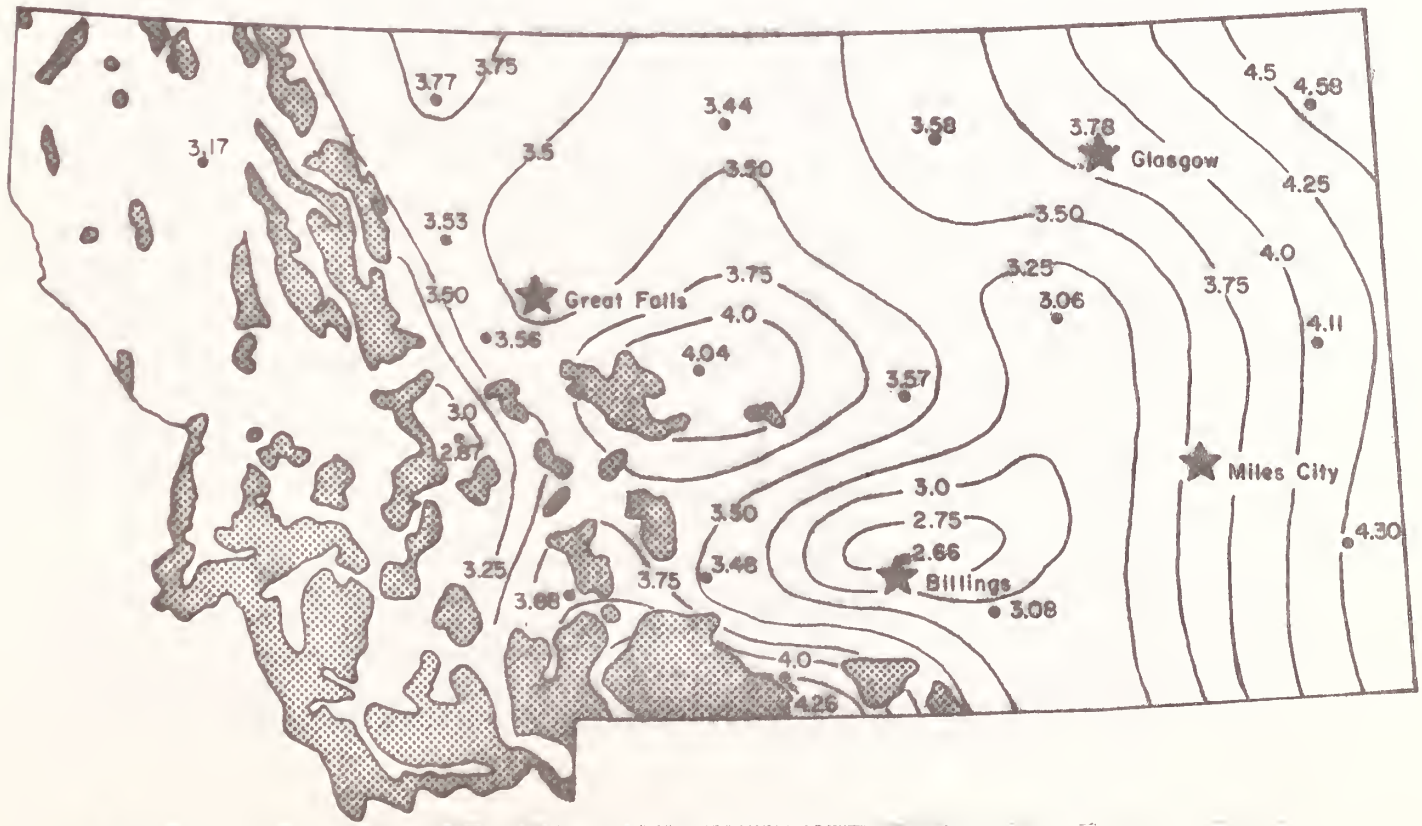

Figure 3: Three-month precipitation total for Eastern Montana. (July, August, September; 1931-1960) (16).

Note: Shading indicates areas over 7,000 feet msl.

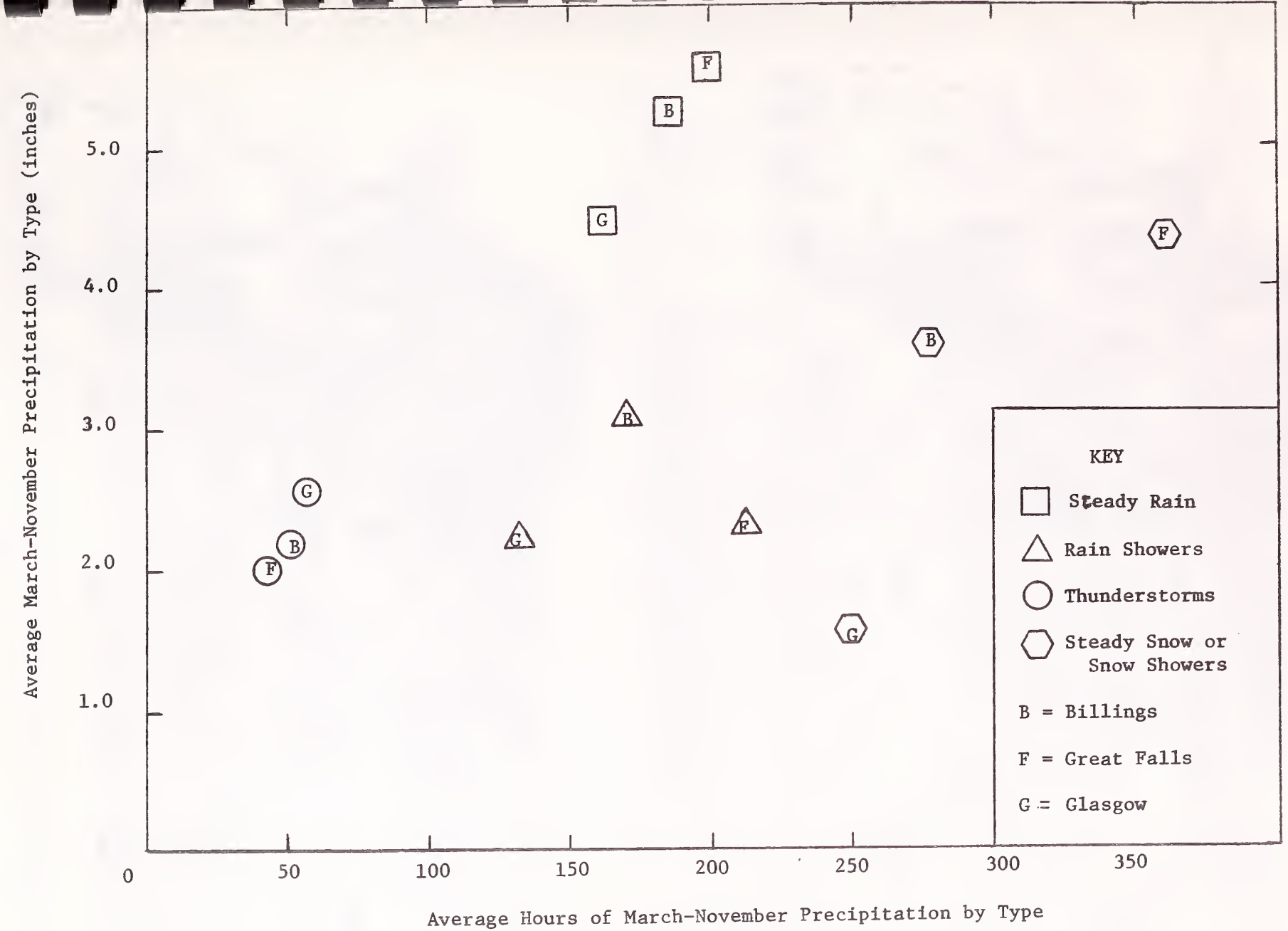

Fig. 4 Comparison of Amount and Frequency of Precipitation by Type at 3 Montana Stations -Based on March through November 1965-1970. (5)

Falls had the highest average hours of rain showers, they were relatively inefficient. That is, average rainfall amounts per hour of showery rain were greater at the other two stations. This was probably due in part to the downslope motion of predominantly westerly flow in the lee of the Rockies.

Table 6, developed from data presented by Grainger, et al. (5), indicates that showery type rain contributes a lesser proportion to the total precipitation at Great Falls than at the other two sites. Again, calculations for Miles City would probably be more similar to those for Billings and Glasgow.

Table 6. Average Percentage of Total Precipitation From "Showery" Type Clouds During Each Three-Month Period. (5)

Station	Apr May June	June July Aug
Billings	33	67
Glasgow	34	61
Great Falls	26	57

Figures 5 and 6 indicate the probability of measureable precipitation occurring during an average week for the three-month periods indicated. Values at individual stations were obtained from a study by Gifford (4). Those for Miles City were calculated for this report using National Weather Service climatological data for Montana. While complete accuracy cannot be claimed for any particular isopleth, both the high gradients and the low probability values immediately east and north of the major range of the Rockies are impressive. In addition, the "sink" in the vicinity of Jordan is quite conspicuous and is probably associated with the fact that Jordan is in a basin and experiences downslope flow for most wind directions. Unlike the Billings and Great Falls areas, the Glasgow and the Miles City areas have neither abnormal values of probability nor strong gradients. Thus, with respect to the probability of occurrence of summer precipitation, the figures strongly suggest that the regions immediately to the lee (east and north) of the mountains are not typical of the high plains. Probabilities are somewhat higher at Miles City than at Glasgow, suggesting that cloud conditions needed for experimentation may be more frequent at Miles City.

The general conclusion to be drawn from the material presented is that the eastern one-third of Montana is more representative of a plains environment than is the area nearer the mountains. The area near Great Falls, known as the "chinook belt," appears especially atypical, with evidence of downslope motion in the frequent but inefficient rain showers and limited surface moisture. Also, the frequency with which moist Gulf air occurs during the summer decreases

Figure 5: Weekly probability of Measureable Precipitation Averaged for March 29 through June 27 (4).

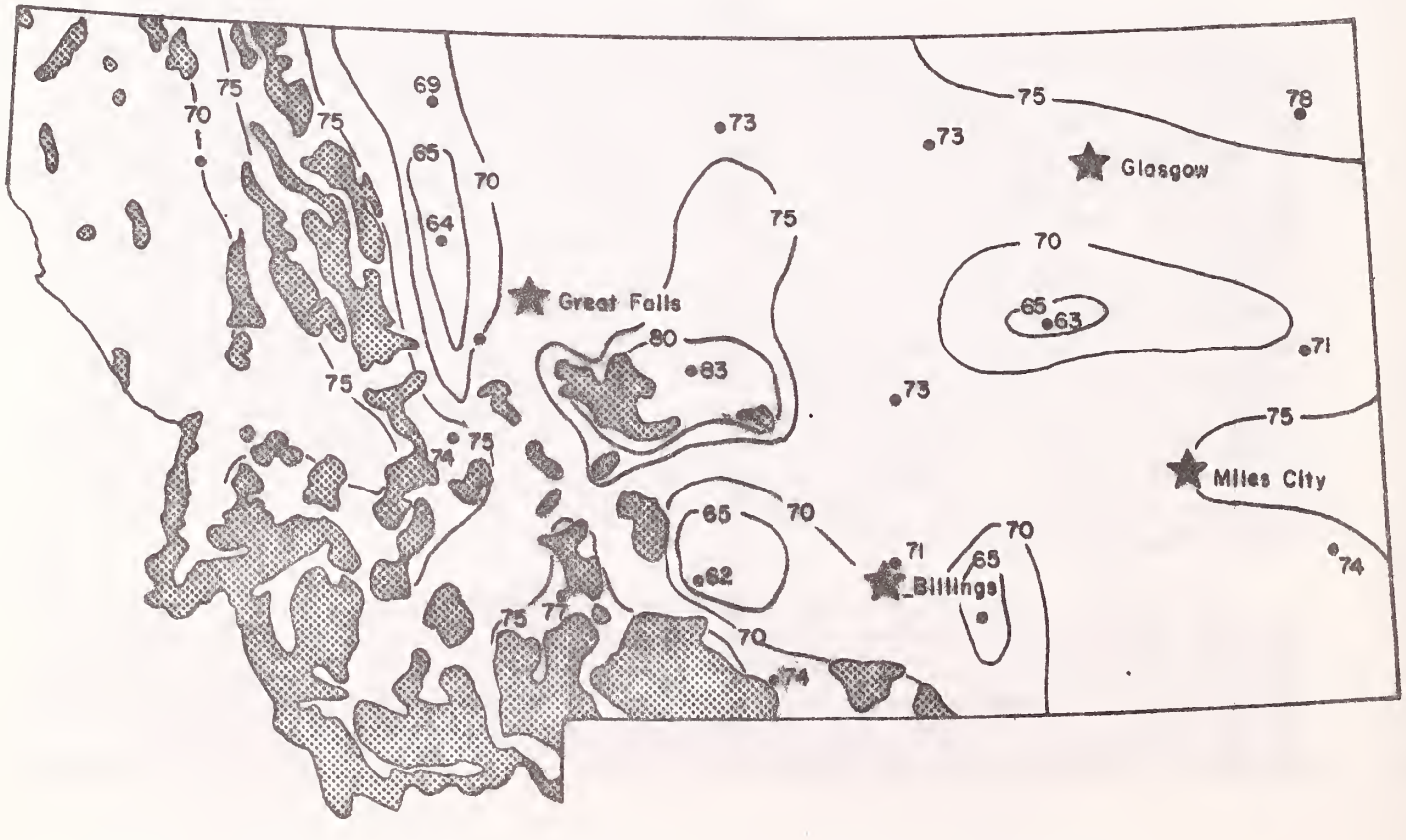

Figure 6: Weekly probability of Measureable Precipitation Averaged for June 28 through September 26 (4).

from southeast to northwest Montana. The precipitation probability maps strongly suggest that portions of the areas surrounding both Great Falls and Billings are subjected to the effects of downslope motion in the lee of the mountains.

One further factor should be noted. The presence of Fort Peck Reservoir near Glasgow may have some effect on the local climate, which would tend to make the area somewhat atypical of the plains environment. However, no such effect has been documented, and this possibility remains speculative.

H. Representativeness

Eastern Montana's central location in the Great Plains is illustrated by Figure 7 (6). Of land classified as Great Plains in the states of Montana, Wyoming, and the Dakotas, forty-four percent lies in Montana. An even higher percentage of what may be called the "Northern High Plains" lies in Montana, although the actual percentage would depend upon the defining criteria.

1. Terrain Features:

The classification of physical land characteristics in the high plains ranges from "level and undulating" through "moderately sloping" and "hilly" to "rough lands and badlands " (7). Because the regions around Great Falls and Billings include significant areas of terrain which are classified as "mountains," they cannot be considered completely typical of the high plains. Although the proximity of mountains may not diminish the validity of research in the remaining area classified as high plains, it basically decreases the operational area and the probability of finding appropriate clouds with which to work.

The regions around Miles City and Glasgow include all terrain features typical of the high plains. It should be noted that the preponderance of terrain around Miles City is within the classification of "rough lands and bad lands," which is consistent with the predominant use of the area as range. The region around Glasgow, while containing a significant amount of terrain in the "roughlands and bad lands" category, also includes about equal amounts in the "level to undulating," "moderately sloping" and "hilly" categories.

2. Climatology

The importance of climatological considerations to an evaluation of area representativeness hardly needs emphasis. In that the climatology factor was considered so important, it has been treated separately and evaluated in the previous section (G. Climatology).

3. Water Use

In contrast with the mountainous sections of the state, water in the eastern plains region of Montana is low in supply, especially during the summer months. Similarly the quantity and quality is much more variable. Yearly runoff comprises the major portion of the surface water supply in eastern Montana and amounts to 0.25 inches. Groundwater discharge constitutes a further source of surface water and is especially significant in the winter months (9).

The single largest consumptive use for water in the plains area of Montana is agricultural. Other important uses include municipal and industrial supplies and recreation. As coal development in the Montana plains area increases, greater industrial demands for the scarce water resource can be expected. Competition for all available sources of water will likely become quite intense as the coal development proceeds.

Figure 7: Eastern Montana's location within the Great Plains Region (6).

4. Land Ownership and Use

a. Ownership

The basic pattern is smaller plots and more diverse ownership in the two metropolitan areas of Billings and Great Falls. Significant concentrations of federally-owned land are found near both Miles City and Glasgow. Approximately fifty percent of the areas surrounding Glasgow and Miles City consistsof Bureau of Land Management land. A lesser amount of federally-owned land is located near Great Falls and Billings. These test areas include some U. S. Forest Service land as well as land controlled by other federal agencies (7).

Two particular situations should be noted concerning the areas around Glasgow and Billings. First,large portions of the Fort Peck and Crow Indian reservations are included in the respective test areas. Secondly, the sixty-mile test area circles intersect the Canadian Border north of Glasgow and the Wyoming Border south of Billings. Neither the Indian reservations nor the political borders pose definite problems, but each must be considered a potential source of difficulties over a period of years.

b. Cropping and Agriculture Land Use

The Northern High Plains falls almost completely into two categories of land resource regions, (7) (1) the "Northern Great Plains Spring Wheat Region " and (2) the "Western Great Plains Range and Irrigated Region", described below. In eastern Montana, two thirds of the area falls into the former category, and one-third into the latter.

(1) Northern Great Plains Spring Wheat Region - The fertile soils and the predominantly smooth topography of this region are favorable for agriculture, althoqgh the low rainfall and short growing season severely restrict the crops that can be grown. The annual precipitation ranges from ten to twenty-four inches, a large portion of which occurs during the growing season. Average annual temperatures are 40° to 45°F. over most of the region. The freeze-free season which ranges from 100 to 145 days, increases in length north to south (7).

The production of spring wheat by dryfarming methods dominates the agriculture of the region. Other spring grains, flax and hay are also grown. Potatoes are grown in many places, and sugar beets and corn are important.

(2) Western Great Plains Range and Irrigated Region - Unfavorable soils, strong slopes or low moisture supplies make success at dryfarming very uncertain in this portion of the Great Plains. The annual precipitation ranges from eleven to twenty-four inches but fluctuates widely from year to year. Average annual temperatures are 45°F. in much of the region and vary from 40°F. in the north to 60°F. in the south. The freeze-free season ranges from 100 days in the north to 160 days in the south (7).

A large part of the region is in range. Some wheat is produced by dryfarming methods, primarily along the eastern margin, and irrigation agriculture is practiced along some of the major rivers. Forage and grain for livestock are the principal crops on irrigated land; potatoes, sugar beets, and vegetable crops are important locally.

A sixty-mile circle around Glasgow encompasses approximately equal portions of each of these regions, while the comparable area around Miles City is entirely within the Western Plains Range and Irrigated Region. The area surrounding Great Falls, while largely divided between the two regions, does contain a third, mountainous classification, which is unrelated to the Great Plains. The Billings area lies within the Western Great Plains Range and Irrigated Region with the exception of a non-typical mountainous area to the south.

The basic pattern in this semi-arid region is a combination of rangeland and high-risk agriculture, together with smaller areas of irrigated land. Irrigation is possible where flowing or impounded surface water or ground water provides adequate, economically feasible supplies. The augmentation of runoff, water storage or ground-water recharge, more relevant to irrigated agriculture, are not immediate considerations in the High Plains effort. However, the effects of induced precipitation from cumulus clouds on unirrigated areas and rangeland, the typical situations in proposed research areas, would appear highly significant.

Information on the Upper Missouri, Yellowstone and Western Dakota subbasins indicates that it is possible to estimate the distribution of unirrigated cropland, irrigated cropland and range over a region largely typical of the northern high plains (7). Over these three subbasins, the average ratio of unirrigated cropland to irrigated cropland is 6.7 to 1. Rangeland comprises an average of sixty nine percent of the total area (7). The ratio of unirrigated to irrigated cropland and the percentage of rangeland in those counties which comprise most of the area in each potential test site are shown in Table.7 (7).

Table 7: Ratio of Unirrigated to Irrigated Crop Land; Percentage of Land Utilized as Range (7).

City	Ratio of Unirrigated to Irrigated Crop Land	Percentage of Land Utilized as Range
Great Falls	11:1	40
Billings	3:1	78
Miles City	5:1	90
Glasgow	17:1	75
High Plains Average	6.7:1	69

Precipitation utilization on crops will be most significant where ratios are high, indicating a preponderance of unirrigated cropland. However, precipitation use will be most typical where the ratios and the percentages of rangeland are most typical. The ratio is most typical at Miles City, but the percentage of rangeland is most typical at Glasgow. Although the figures for Billings are most typical considering both parameters, the variation in ratio from the High Plains average is significant.

c. Other Land Uses

Agriculture comprises the major land use in eastern Montana. The nature of the environment has resulted in a population density of one person per square mile and, as noted, an economy which is based upon livestock and dryland farming, with lesser amounts of irrigated agriculture. With the exception of the larger metropolitan areas of Billings and Great Falls, most towns have fewer than 2,500 people. Very little industrial development has taken place in the area. As energy development proceeds, greater quantities of land will be committed to this use.

5. Environmental and Ecological Regions

a. Vegetation

With an occasional exception due to elevation, the northern high plains is classified as semi-arid with a predominant vegetation of mixed prairie grass and secondary vegetation of short prairie grass (7). The proposed research areas around Miles City and Glasgow fall completely within this classification, but the areas around Great Falls and Billings are not uniformly typical.

b. Soils

A state the size of Montana encompasses a broad array of climatological, geological and topographical conditions. Consequently, a variety of soil conditions is encountered. In general, soils in the wetter portion of Montana (western) are similar to those in the Pacific Northwest, while those in the drier part of the state (eastern) are desert-like. The following discussion, although not exhaustive, provides an overview of those soils which are found in eastern Montana. The information is based upon the recent work of Southard (13).

The Great Falls vicinity is largely characterized by equal areas of Chestnut and Chernozem soils, and Brown and Solodized-Solenetz soils of the northern glacial till plain. Approximately fifteen percent of the area contains the Gray Wooded and "Brown Podzolic" soils which are common to mountainous regions.

Brown and Solodized-Solonitz soils and Chestnut and Chernozum soils comprise much of the Glasgow area. Unlike the Great Falls area, alluvial soils are found on about ten percent of the area. Approximately ten percent of the area is dominated by fine-textured, shallow to moderately deep soils over shale.

Billings has the greatest diversity of soil types. About one-half of the area contains Lithosols with Brown soils on the uplands. The remainder consists of alluvial soils, fine-textured soils over shale, and Chestnut and Chernozem soils. Less than five percent of the area contains the Gray Wooded and "Brown Podzolic" soils.

Miles City is the most homogeneous with respect to soil conditions. About eighty percent of the area is dominated by Lithosols and Brown soils. The remaining area is about equally divided between alluvial soils and fine textured soils (shallow to moderately deep) over shale.

The sensitivity of Montana farmers and ranchers to saline seep must be noted. The seepage results from geological structure, precipitation and, most importantly, the "alternate fallow" agricultural practice. Although not proven, it is theoretically possible that additional, controlled amounts of precipitation could actually diminish the problem by making annual cropping possible. It must be noted that the Miles City area is the only proposed Montana test site that lies largely outside the saline seep region (1).

c. Geology

A large portion of the eastern Montana plains region is underlain with sedimentary rocks. These are dominantly shale, sandstone and siltstone. The rocks in the Great Falls area are entirely Mesozoic, while those in the Glasgow vicinity are both Mesozoic and Cenozoic. The Miles City area is, for the most part, underlain by Cenozoic sediments; about ten percent of the area is Mesozoic. The Billings site has the most heterogeneous geology in that it contains Cenozoic, Mesozoic and Paleozoic sediments. A very small portion is underlain with Early Precambrian metamorphic rocks. That area east of the Rocky Mountains and north of the Missouri river has been glaciated. The deposited glacial till is comprised of sand, silt, clay, gravel, cobbles and stones. The glaciation is evident at only the Glasgow and Great Falls sites (13).

d. Wildlife and Aquatic Life

The eastern portion of Montana possesses a rich diversity of wildlife and aquatic life. Large mammal species include white tailed and mule deer and prong-horn antelope. Upland birds are found throughout the region and consist of the sage and sharptail grouse as well as limited populations of Merriam's turkey and chukar. Among the waterfowl are the two swan species, five species of geese and numerous duck species. The lower reaches of the Yellowstone and Missouri rivers and their tributaries contain walleye, sturgeon, northern pike, channel catfish and sauger (9).

e. Air Quality

The quality of eastern Montana's airshed can generally be considered excellent. Air pollution problems are usually confined to the larger metropolitan areas of Great Falls and Billings, although for the most part air quality standards are being met. Agricultural operations, some construction activities and travel on unpaved roads create limited dust pollution problems.

f. Weather

The variability of weather - hail, moisture, wind, dust - from year to year is extremely significant to all groups throughout this dry region of the high plains. It is possible that public response to such changes would be a tendency to blame researchers for adverse conditions, leading to a decline in the effectiveness of the research and a loss from the research investment.

7. Conclusions

Among the four potential sites in Montana and on the basis of terrain features, one must question the representativeness of Great Falls and Billings because of proximity to the mountains. On the other hand, there is absolutely no question concerning the representative nature of both Glasgow and Miles City.

On the basis of climatological factors, it appears that the sites near Glasgow and Miles City are most representative of the northern plains region. Portions of the areas surrounding Great Falls and Billings are subject to downslope motion on the lee of mountains with more inefficient rain showers and limited surface moisture. On the other hand, the greater frequency of moist Gulf air in Miles City and Glasgow areas suggests that conditions for cloud experimentation are more likely. Further, the probabilities of summer rainfall occurrence are somewhat higher in the Miles City area.

The Glasgow area is more typical in that it includes approximately equal portions of the two major land resources regions of the northern great plains (i.e. the Northern Great Plains Spring Wheat and the Western Great Plain Range and Irrigated Regions).

On the basis of land ownership, Miles City and Glasgow are non-typical because of the preponderance of federal land control. Great Falls and Billings are non-typical because of the high population and diverse land ownership and use. Of these two anomalies, it is very likely that the large portion of land under federal ownership would enhance the probability of a successful research program over a period of years. However, the diverse land ownership and large populations near the two metropolitan areas might be sources of problems over a period of years.

It is appropriate to note that at Glasgow the proximity of both the Canadian Border and the Indian reservation might be viewed as a potential source of problems over a period of years. Glasgow would be most typical for examining the effect of precipitation over rangeland, but Miles City would be most representative in studying the effect of precipitation over typical proportions of unirrigated and irrigated land.

From the standpoint of environmental and ecological regimes, one again questions the representativeness of Great Falls and Billings since portions of

the areas fall into mountainous regions. Again, there is no question concerning the representative nature of either Glasgow or Miles City. The low probability of saline seep in the Miles City area should also be noted.

Thus far, representativeness as a criterion separates Billings and Great Falls from the two eastern Montana areas. That is, Billings and Great Falls are less representative of the High Plains than are Glasgow or Miles City in terms of land and water utilization, cropping pattern, environmental and ecological regimes and terrain features. Other considerations must be used to choose between the Miles City and Glasgow areas.

A more detailed examination of these two potential sites reveals that in the Glasgow area almost seventeen percent of the total land is in irrigated and unirrigated crops, compared to only four percent in the Miles City area. In view of the uncertainties concerning cloud response to seeding, and because the objective of the research is to reduce these uncertainties, the small area of cropland with its relatively high value crops should enhance the probability of successfully conducting the research over a period of several years.

For the preceding reasons, the locations are arranged in the following priority:

(1) Miles City
(2) Glasgow
(3) Billings
(4) Great Falls

IV. SUMMARY AND CONCLUSIONS

Five of the eight factors which the Bureau of Reclamation will use for rating sites have been used to compare the four potential Montana sites. These factors are local research interest, area needs, scientific facilities, climatology and representativeness.

A high degree of support for the High Plains Program was evident in all potential test site locations with the exception of the Billings area. The general lack of interest in weather modification research in that area might be considered an impediment to experimentation. In addition, Glasgow and Miles City would have fewest limitations to aircraft operations, which would be particularly restrictive in the Great Falls area (see Appendix B). The overall comparison of sites thus indicates that the Billings and Great Falls areas would be less suitable than those at Glasgow and Miles City.

In terms of public interest, scientific and support facilities, and climatology, Montana has two areas which are especially suitable for the northern high plains test sites -- Glasgow and Miles City. Neither site is significantly superior, and both are highly representative of the northern high plains region.

The Miles City area has a slightly greater frequency of cloud conditions which are suitable for experimentation. Further, in contrast with Glasgow, the Miles City area has a lesser potential for saline seep. Although the impact of increased rainfall upon this condition should be addressed in the High Plains study, it is felt that until causal relationships are understood areas with a greater saline seep potential should be avoided. It might also be noted that several respondents to the High Plains attitude survey expressed doubts concerning cloud seeding experimentation over potential saline seep areas (see Appendix C).

A final, and perhaps not as important, consideration deals with crop acreage. Areas containing greater acreages of high value cropland pose a potential problem during years of abnormal weather conditions. In that the Miles City area has a lesser cropland acreage, it is perhaps more suitable for weather modification research.

Therefore, on the basis of the preceding discussion, the Miles City vicinity is slightly more appropriate for a summer weather modification program. Therefore, Miles City is recommended as the most favorable Montana site for the northern plains test facility of the High Plains Cooperative Program.

LITERATURE CITED

APPENDICES

LITERATURE CITED

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APPENDIX A

Operational Considerations for Site Selection

(Bureau of Reclamation)

Operational Considerations for Site Selection
High Plains Cooperative Program

A typical site should have the radar operation and project headquarters located at the central airport. Separation of radar and forecasting from airport is inefficient.

1. Airport must not be limited to one operational runway and must have at least one existing paved and lighted runway 4,500 feet or longer. It would be desirable to have operational Instrument Landing System (ILS) at airport, and VORTAC in area is very desirable.

2. Airport must have maintenance and service facilities with aircraft mechanic at least on call 7 days per week. Hangar space for foul-weather and night-time maintenance.

3. Site must have airconditioned office space to accommodate heat sensitive computer, plotting, teletype and facsimile terminals. How must floor space? 1000 square feet?

4. Telephone circuits to any site must be of sufficient quality to accommodate computer data transmissions and facsimile and teletype services without undue interruption. Direct dial long-distance is preferable.

5. Site for radar should have a obstruction free scan area and a reliable 220-volt power supply. What regulation? Three-phase? Peak demand? $\pm$ 10 percent Single 20 kw

6. All-weather roads to radar site and airport must be available and reasonable all-weather road network in project area.

7. Commercial living and dining accommodations at reasonable rates for 10 to 20 people during summer months must be available within a reasonable distance of radar and airport site. The nearer the better. Ready-room quarters desirable.

8. There should be a town within 20 miles of operational site with automobile, recreational, church, and other miscellaneous facilities to serve needs of project personnel for prolonged stay. A nearby airline stop is desirable (air express service for parts, etc).

APPENDIX B

Federal Aviation Administration Comments

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

AIR ROUTE TRAFFIC CONTROL CENTER
P. O. Box 8000
Malmstrom AFB, Montana 59402

February 15, 1974

Mr. Arlin B. Super, Professor of Meteorology
Montana State University
Department of Earth Sciences
Bozeman, Montana 59715

Dear Mr. Super:

This letter is confirmation of your discussions with Mr. Kittelson pertaining to the Weather Modification Program outlined in your letters of January 24, 1974 and February 1, 1974. Our comments relative to the four sites that you are considering are as follows:

1. GREAT FALLS, MONTANA -

Great Falls is the least desirable location for the cloud seeding activity due to the type of flight operations that are conducted within the area. The Great Falls International Airport is one of the principal hubs in the state. There are four scheduled air carriers operating into and out of the terminal. In addition, interceptors of the Montana Air National Guard operate out of the airport and are on 24 hour alert. Malmstrom AFB, although it does not have interceptor aircraft at this time, does have locally based aircraft that operate on training missions into and out of the Great Falls terminal area. The Air Defense Command training areas are located to the north of Great Falls. Aircraft from the Great Falls International Airport and Malmstrom AFB operate into these areas daily. In addition, there is local flight training in the form of instrument approaches, test flights, etc., that are performed regularly.

The air carrier operation is principally from the southeast from Billings and the southwest and west from Butte and Spokane. There are some Western flights operating from Canada and Hughes Air West flights from Kalispell. For the most part, these flights would be arriving and departing Great Falls at about the same time that the cloud seeding operation would be conducted.

Although we cannot rule out the possibility of cloud seeding operations at this location, there is little doubt that other aircraft activities would greatly restrict the operation. In your letter, you indicated that the seeding would generally be done during shower activity and during times when instrument flight would, in all probability, be required. In addition, you would need a block of altitudes. If the operation is to be conducted at Great Falls, we will have to determine an area or areas that will have the least impact on other operations and confine the cloud seeding to those areas.

2. BILLINGS, MONTANA -

The Billings area has been coordinated with both the Chief of the Billings Tower and with the Salt Lake City ARTCC. Although the Chief of the Billings Tower has indicated that they could handle the cloud seeding within the airspace delegated to them, the Salt Lake City Center is not quite as optimistic. Billings is another hub for Montana that generates considerable aircraft activity. There are three scheduled airlines that operate into the terminal in addition to the fixed base operators and private pilots. The activity is the heaviest whenever instrument weather prevails within the terminal area. Because of this, the restrictions to cloud seeding operations for this location would also be quite stringent. Billings is much the same as Great Falls as far as the cloud seeding is concerned and could be placed in the same category. In our opinion, it is ranked number three.

3. MILES CITY, MONTANA -

Miles City is a low activity area as far as aircraft operations is concerned, and could be used as a cloud seeding area with little impact on other operations. There are two drawbacks to this area; one is the lack of low altitude radar coverage, and the other is that both the Salt Lake City Center and the Great Falls Center would become involved in an operation conducted within a sixty (60) mile radius of the terminal. Because of these two factors, there will be restrictions to the cloud seeding program. We consider Miles City as the number two location.

4. GLASGOW, MONTANA -

Glasgow is located in a relatively light air traffic area. Our Center has good radar coverage, both low altitude and high altitude,

and we also have very good communications capability in the area. Communications are available both through the Center's remote outlet at Glasgow and through the communications facilities that are remoted to the Miles City Flight Service Station. In our opinion, Glasgow is the best location for cloud seeding operations. Very few restrictions would be required and the cloud seeding operation could be accomplished with a minimum amount of interference from other aircraft activities. This could change if activity at the Glasgow AFB increases considerably; however, we have no information indicating that this will occur.

Sincerely,

Harold W. Lufkin

HAROLD W. LUFKIN
Chief, ARTCC

APPENDIX C

Solicited Comments

Comments were solicited from the following agencies and organization. Those starred have not responded.

U. S. Dept. of Agriculture, Forest Service, Steve Yurich, Regional Forester
U. S. Dept. of Agriculture, Soil Conservation Service, A.B. Lindford, State Conservationist
U. S. Bureau of Land Management, Edwin Zaidlicz, State Director
U. S. Bureau of Indian Affairs, James Canan, Director

State

Department of Agriculture, George Lackman, Commissioner
Department of Fish and Game, Wesley R. Woodgerd, Director
Department of Health and Environmental Sciences, John S. Anderson, Director. Maxwell K. Botz, P.E., Water Quality Bureau
Department of Livestock, Glenn C. Halver, D.V.M., Administrator and State Veterinarian
Department of State Lands, Ted Schwinden, Commissioner

Organizations

League of Women Voters of Montana, Gladys Elison, President
Montana Wildlife Federation, Donald Aldrich, Executive Secretary
Montana Wilderness Association, Doris Milner, President
*Great Plains Resources Council, Kit Muller
*Montana Stockgrowers Association, Mons Tiegen
*Western Montana Fish and Game Association, Paul Brunner
*Sierra Club, Jean A. Warren, Chairman

UNITED STATES DEPARTMENT OF AGRICULTURE
FOREST SERVICE
FEDERAL BUILDING MISSOULA, MONTANA 59801

TELEPHONE: 549-6511
AREA CODE 406

2700

REC'D
FEB 25 1974
MONT. DEPT. of NATURAL RESOURCES & CONSERVATION
FEB 22 1974

Gary Wicks, Director
Department of Natural Resources
and Conservation
32 South Ewing
Natural Resources Building
Helena, Montana 59601

Dear Gary:

In response to your letter of February 11, I can assure you that the Forest Service is very interested in all aspects of weather modification. As a public agency we are fully cognizant of our responsibility to consider proposals designed to relieve existing energy and food problems. At the same time, we have the specific responsibility to protect and properly manage those lands for which we are responsible.

The ecological implications of long-time modification are speculative at best, but form a basis for genuine concern. Increased precipitation over a long period of time can hardly fail to produce a change in native vegetation. The evolutionary adaptation of plant and animal populations to changes in quantity and/or timing of precipitation is sure to occur and might be quite significant. This change could have adverse results especially if weather modification were suddenly halted. The adapted species would be unlikely to survive the transition.

Another special interest area involves soil-water relations. Watersheds, over the years, have reached an equilibrium with present precipitation patterns. Significant changes in these patterns could create an accelerated erosion potential of unknown magnitude and certainly have an effect on the water table.

These are examples of the questions raised by my staff and certainly indicate the need for increased research into the matter of weather modification. These issues are not raised to imply that we oppose weather modification, but to express our concern over the unknowns of such programs. We are most interested in research efforts which will provide the basis for scientifically supportable data on which to make better land management decisions.

There are steps that should be taken before we could approve or reject a research proposal on Forest Service lands. First, we would like to

review a complete and comprehensive plan of study. Second, we might require an Environmental Impact Statement should we feel the planned research is of major significance or of a controversial nature. Third, it would be necessary to enter into a cooperative agreement with all parties concerning the phases of study involving Forest Service lands.

Please keep us informed of the progress you make toward this research effort and feel free to call on me and my staff for information or assistance.

Sincerely,

Ray Kurr

for STEVE YURICH
Regional Forester

UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
P. O. Box 970, Bozeman, Montana 59715

FEB 25 1974
MONT. DEPT. of NATURAL RESOURCES & CONSERVATION

February 22, 1974

Mr. Gary J. Wicks, Director
Department of Natural Resources and Conservation
State of Montana
32 S. Ewing St.
Helena, Montana 59601

Dear Gary:

Thank you for the opportunity to comment on the proposed High Plains Cooperative program.

The Soil Conservation Service(SCS) supports a research program to fully evaluate practical and potential increases or decreases in precipitation. We are aware of the significance of such research to our natural resources in Montana. Since precipitation changes during this research are likely to be minimal, we would suggest that the location selected be one that best meets criteria desired for base of operations and climate.

Should such a program become operational in Montana, we would appreciate the opportunity to comment on the changes we would anticipate in various seeded areas. We feel our initial input would be most useful to the Department and the University at this time.

We are not aware of existing conflicts or opposition to a research program in the agricultural and rural populations in the proposed study areas. We would anticipate some questions being raised about the affects of an operational program on the ecology of the area.

We would appreciate being currently informed of progress in the study and may have pertinent soil and resource data valuable to the study.

Sincerely,

A. B. Linford
State Conservationist

IN REPLY REFER TO

930: 9214

United States Department of the Interior

BUREAU OF LAND MANAGEMENT

STATE OFFICE
316 NORTH 26TH STREET
BILLINGS, MONTANA 59101

FEB 20 1974

RECEIVED
FEB 21
MONT. DEPT. OF NATURAL RESOURCES & CONSERVATION

Mr. Gary J. Wicks, Director
Dept. of Natural Resources & Conservation
32 South Ewing, Natural Resource Building
Helena, Montana 59601

Dear Gary:

Thank you for the recent correspondence concerning the High Plains Weather Modification Research Program. We are definitely interested in the program and would appreciate being kept informed of the progress. At this time I do not know what the Bureau's involvement would be, nor can I foresee any conflicts with our programs if the program is undertaken in the proposed areas.

Sincerely yours,

Ed Zaidlicz

Edwin Zaidlicz
State Director

United States Department of the Interior
BUREAU OF INDIAN AFFAIRS
BILLINGS AREA OFFICE
316 NORTH 26TH ST.
BILLINGS, MONTANA 59101

RECEIVED
FEB 2 8 1974

IN REPLY REFER TO:
Land Operations
SMC
903

FEB 2 7 1974

Mr. Gary Wicks, Director
Department of Natural Resources and Conservation
32 South Ewing
Natural Resources Building
Helena, Montana 59601

Dear Mr. Wicks:

Responding to your letter of February 11, we are furnishing these comments in connection with the research effort that will test scientific concepts of summer cloud seeding. Since Montana is one of those areas in which the amount of available water for agriculture is a matter of economic significance, we think such controlled scientific testing should be welcomed. It is experimental programs such as this that man may be allowed to reap the benefits of environmental manipulation.

The Billings Airport has excellent VORTAC navigational system, and the facilities are more than sufficient for the type of aircraft that will probably be utilized.

Crow, Fort Peck and Northern Cheyenne Agencies have been asked to furnish comments in connection with the proposed project. These responses are not available but will be furnished by February 28, 1974.

Sincerely yours,

Assistant Area Director

STATE OF MONTANA
DEPARTMENT OF AGRICULTURE

THOMAS L. JUDGE
GOVERNOR

GEORGE LACKMAN
COMMISSIONER
CAPITOL ANNEX BUILDING
HELENA, MONTANA 59601
TELEPHONE: 406-449-3144

RECEIVED
FEB 26 1974
MONT. DEPT. OF NATURAL RESOURCES & CONSERVATION

TO: Gary J. Wicks

FROM: George Lackman

SUBJECT: High Plains Weather Modification Research Program

The Department of Agriculture looks with favor on the project in question. Additional moisture, during the proper season, could have a positive result in production levels and income to Montana farmers.

There appears to be a great deal of discussion concerning weather modification, however, much of it seems to be opinion. I believe the program as outlined will develop the objective data base needed in this matter.

A point that should receive special consideration in the planning for the project is the relation or effect upon saline seep conditions that may be located in or around the selected testing site of altered moisture patterns.

A further suggestion would be that the research programs initially apply only to dry land areas including both crop land and range.

If this Department can be of service in any phase of the High Plains project, we would be happy to cooperate.

Sincerely,

George Lackman
Commissioner

STATE OF MONTANA

DEPARTMENT OF

FISH AND GAME

Helena, Montana 59601
February 19, 1974

RECEIVED
FEB 21 1974
MONT. DEPT. OF NATURAL
RESOURCES & CONSERVATION

Mr. Gary Wicks, Director
Department of Natural Resources
and Conservation
Helena, Montana 59601

Dear Gary:

I have received your letter inviting comments regarding weather modification involving summer cloud seeding. Due to the specific nature of this project, we certainly do not have the degree of objection to this phase of weather modification that we did to the seeding of winter storms in the Hungry Horse watershed.

That should not be construed to mean that we endorse this project, however. Given the problems this state has with water use, saline seep and other major environmental problems, we question the advisability of investing in this kind of additional environmental tinkering.

This is based on the basic philosophy held by our department that the problem confronting us is to plan to live with the natural system and stop devising single-objective projects aimed at altering or modifying a component of that environmental system without having any knowledge of the segments of the natural system that are ultimately going to be affected by that action.

Saline seep should have taught us that it is difficult, if not impossible, to predict what our actions of this nature will ultimately produce. The proposal now seems to be that we should begin supplementing natural precipitation, and many of the areas in which we propose to do this are already plagued by rising groundwater levels that have produced the saline seep problem.

Perhaps what we need to do is try and direct academic research efforts toward more relevant problems.

Sincerely,

Wesley R. Woodgerd
State Fish and Game Director

WRW/JAP/sd

Department of Health and Environmental Sciences
STATE OF MONTANA HELENA, MONTANA 59601

John S. Anderson M.D.
DIRECTOR

RECEIVED
FEB 26 1974
MONT. DEPT. of NATURAL
RESOURCES & CONSERVATION

February 25, 1974

Gary J. Wicks, Director
Dept.of Natural Resources and
Conservation
32 South Ewing
Helena, Montana 59601

Dear Gary:

The High Plains Weather Modification Research Program can be a very worthwhile asset to Montana, for various reasons.

Some of these are the added funds in the state, the possible increase in precipitation in an area badly needing increases, and the scientific knowledge gained by the state. Also there is the possibility to engage the use of some facilities in the state that are as of now not being used.

Precautions should be undertaken to insure a safe and worthwhile program. Scientific precautions such as a comprehensive rain gauge network downwind to detect downwind suppression of precipitation due to seeding or political and social precautions such as seeding during harvesting periods or seeding during other controversial times should be researched thoroughly prior to attempting a project such as this. With these and other aspects of cloud seeding analyzed thoroughly, Montana should profit very much from a project of this magnitude.

Sincerely yours,

John

JSA/acw

John S. Anderson, M.D.
Director

Department of Health and Environmental Sciences
STATE OF MONTANA HELENA, MONTANA 59601

John S. Anderson M.D.
DIRECTOR

February 20, 1974

FEB
RESOURCES

Mr. Gary J. Wicks, Director
Department of Natural Resources
and Conservation
32 South Ewing
Helena, Montana 59601

Dear Mr. Wicks:

In response to your letter on cloud seeding, our Bureau has no objections to an experimental program. However, we are concerned over two aspects of such a program; the distribution of AgCl into aquatic systems and possible erosion and sedimentation problems that may be caused by increased runoff. The experimental tests should provide an opportunity to examine both aspects of the program.

Yours very truly,

MKBotz

Maxwell K. Botz, P.E.
Water Quality Bureau
Environmental Sciences Division

MKB:mg

STATE OF MONTANA
DEPARTMENT OF LIVESTOCK

THOMAS L. JUDGE, GOVERNOR

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Robert L. Deschamps, Jr., Bonner

HELENA, MONTANA 59601

ANIMAL HEALTH DIVISION

John W. Safford, D.V.M.
Administrator
449-3074

BRANDS - ENFORCEMENT DIVISION

Wm. G. Cheney
Administrator
449-2044

February 20, 1974

RECEIVED
FEB 21 1974
MONTANA NATURAL RESOURCES

Gary J. Wicks, Director
Department of Natural Resources
and Conservation
32 South Ewing
Helena, Montana 59601

Dear Mr. Wicks:

High Plains Cooperative Program - Cloud Seeding

Limited review has been made in the past few days with members of the Board of Livestock and other stockmen on the proposed long-term summer cloud seeding research program.

Stockmen are very interested in the program and quite certainly will attend the informational meetings proposed. The enumerated safeguards of limited trials initially, consideration for harvest season and hopefully, haying season interruptions and local resident planning input make the proposals acceptable.

In the interest of livestock disease problems, the economic benefit of ample forage for livestock grazing and hay reserves supersedes disease risk. Of the endemic soil-borne and vector animal diseases of Montana, the incidence of those associated with drought are more intense and prolonged than those of normal or above average precipitation conditions.

Should further inquiry of stockmen reveal attitudes different from this generalization, you will be advised.

Yours truly,

GLENN C. HALVER, D.V.M.
Administrator & State Veterinarian

GCH:am

STATE OF MONTANA

DEPARTMENT OF STATE LANDS

STATE CAPITOL HELENA 59601 (406) 449-2074

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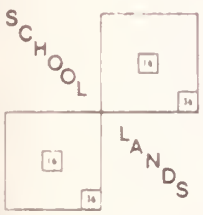
AUDITOR

TED SCHWINDEN
COMMISSIONER



RESOURCE
FOR THE
RESENT

OPPORTUNITY
FOR THE
UTURE

February 25, 1974

Mr. Gary Wicks, Director
Department of Natural Resources
32 South Ewing Street
Helena, Montana 59601

Dear Mr. Wicks:

This department encourages controlled experimentation with weather modification as outlined in your letter of February 11, 1974. We do, however, have some comments on possible location of such experimentation and a few broad suggestions on project design and assistance.

Location: As you are aware, the public and resource managers are becoming increasingly concerned with saline seep problems in certain areas of the state. Experimentation with weather modification in areas of major concern over this problem may cause a localized increase in damage to agriculture land because of saline seep. The possible experimental areas centered on Great Falls, Glasgow and Miles city have a reported developing salinity problem. With exception of areas in northern Stillwater County, this department is not aware of numerous reports of saline seep caused by dryland agricultural practices in the Billings region. Further investigations of this region for possible salinity problems should be made prior to final selection.

Economic: We would like to emphasize the necessity of detailed economic analysis in conjunction with any weather modification program evaluation. We are sure numerous economic benefit studies have been conducted. However, it is vital that the long range economic commitments of weather modification be understood by the public. It would appear that once weather modification is conducted on an operational scale, then the resulting economic adjustments and establishment of economic systems would virtually dictate that the weather modification program could not be terminated without disastrous economic disruption.

State Lands: With the scattered distribution of state lands, this department could assist in the location of remote instrumentation and research plots.

Air Quality: The selection of the Billings region could mean that air flow and weather pattern knowledge resulting from a weather modification study program would benefit planning for industrial activity in eastern Montana.

I hope these comments will be useful.

Sincerely,

TED SCHWINDEN, Commissioner
Department of State Lands

TS:RSD:pm

LEAGUE OF WOMEN VOTERS OF MONTANA
6630 SIESTA DRIVE, MISSOULA, MONTANA 59801

RECEIVED
FEB 26 1974
MONT. DEPT. of NATURAL
RESOURCES & CONSERVATION

February 24, 1974

Mr. Gary J. Wicks, Director
Department of Natural Resources
and Conservation
32 South Ewing
Helena, Montana 59601

Dear Gary:

As per your letter of February 11, concerning the High Plains Cooperative Program.

As you know, there are at least two levels of organization in the League of Women Voters who might have some interest in the weather modification program. On the state level, we have been following the weather modification idea since the 1973 session of the legislature. At that time, we opposed a bill broadening possible use of weather modification in Montana. We did not oppose the bill because of opposition to weather modification per se, however, but because of other aspects of the bill which we felt did not give all citizens an equal voice in its operation. The League in Montana has not studied the weather modification program and consequently has no official position on it, either in support or in opposition. My position as state league president therefore, would be "no comment", especially if the Bureau of Reclamation and the state department of Natural Resources maintain an adequate program of citizen involvement and information. My experience in the program so far indicates that this kind of citizen contact is well provided.

There are locally organized leagues in Billings and Great Falls, and members at large in Miles City and Glasgow. To my knowledge, neither of the local groups has studies or positions on the use of cloud seeding for weather modification. Consequently, so long as the programs of citizen information and involvement are carried out, I would expect no opposition from the Leagues as groups. This is not to say that there are not individuals in these groups or other local leagues organized in the state that will not oppose the program as individuals. However, as a research program I would expect somewhat less criticism than for an actual practical program.

LEAGUE OF WOMEN VOTERS OF MONTANA
6630 SIESTA DRIVE, MISSOULA, MONTANA 59801

The current status of weather modification control and experimentation is not widely known in Montana. Western Montana has knowledge primarily of a rather sloppy project designed to increase snowpack and consequently reservoir supplies of water in the Hungry Horse dam area. Information output from the project was almost nil, due to inexistent data gathering and evaluation, and the attitudes of the companies involved so arrogant as to alienate almost everyone involved. The extent of knowledge about this program in the Eastern parts of the state I cannot assess, but would expect some fallout.

The winter snowpack experimentation done through the Montana State University seems somewhat better documented, though not widely known. Even relatively informed people in Bozeman itself were not aware the project had been carried on. Some ranchers in the area have voiced criticism of a "scatter gun" approach, since the actual seeding and data gathering were done by MSU and social factors apparently considered by Colorado. One of the ranchers involved expressed concern over a lack of follow-up, especially with those immediately concerned with the project, e.g. those whose land was included in the expected increased snowfall.

On the positive side, the effects of a very dry year in 73 have increased interest in the possibility of increasing moisture by seeding summer clouds. Agriculture is the life blood of the state and research to find methods of maintaining its productivity through good and bad years will find much support.

A research program, carefully planned to provide useful information and accompanied by full disclosure of techniques and procedures, emphasizing the total effects of modification, to environmental and social systems as well as to increased rainfall should be well received in Montana.

Thanks for the opportunity to comment on this program.

Sincerely,

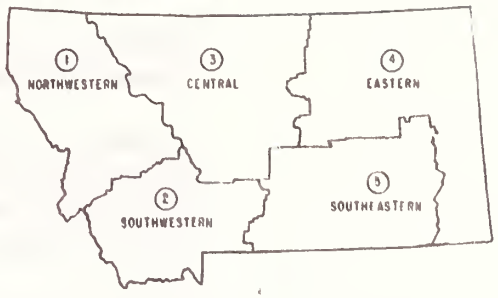
Gladys Elison
President
LWV of Montana

EDUCATION -- CONSERVATION

Montana Wildlife Federation

AFFILIATE OF NATIONAL WILDLIFE FEDERATION

410 Woodworth Ave.
Missoula, Montana
February 21, 1974



Mr. Gary Wicks, Director
Department of Natural Resources and Conservation
32 So. Ewing
Helena, Montana

FEB 25 1974

Dear Gary:

In reply to your letter of February 11 regarding the High Plains Cooperative Program of summer cloud seeding; I am pleased to read that informational meetings will be held in the four prospective bases to determine degree of local interest and support for the program. Certainly unalterable opposition would be sufficient reason to disqualify an operation site. I do not believe our state organization would become involved in the selection of sites unless a local affiliate sought support.

Our organization has opposed project cloud seeding in the past because it was not accompanied by adequate environmental evaluation and because it had the Bob Marshall Wilderness area as a target. For this reason I am in no position to oppose research-oriented weather modification based on existing policy.

I am concerned, however, that the program's broad objective, "...to reduce scientific, economic, legal and environmental uncertainties..." does not mention ecological uncertainties.

There may not be justification for raising a morality issue, but we must be concerned with the possible ecological impact of changing weather patterns. It appears obvious now that our Indian predecessors had a far better attitude toward the earth's capabilities than we now have. Perhaps future historians will determine that we should

have adjusted to the vagaries of weather rather than adjusting the weather.

Summer fallow and irrigation which have done so much for agriculture are now identified as the villains of saline seep. Perhaps we should show more respect for natural systems.

Unless something I do not anticipate develops, our organization will not oppose research projects that give consideration to those in the immediate area and to the capabilities of our life support system.

Sincerely,

Don Aldrich

Donald Aldrich
Executive Secretary
Montana Wildlife Federation

The Montana Wilderness Association

Route 1, Box 1410
Hamilton, Montana 59840

RECEIVED

FEB 25 1974

MONT. DEPT. of NATURAL RESOURCES & CONSERVATION

Mr. Gary Wicks, Director
Dept. of Natural Resources
and Conservation
32 South Ewing
Helena, Montana 59601

Dear Gary:

Thank you for your letter of February 11 and for the opportunity to comment on the High Plains Cooperative Program.

The Montana Wilderness Association is unalterably opposed to operational weather modification programs or to any "operational" project which is proposed under the guise of research.

If the High Plains program is long-term I would also hope that it is oriented toward the identification of all of the long-range effects of cloud seeding. Of greatest concern are the more subtle ecological effects on our life support system. I would strongly suggest that the program's goal of reducing "scientific, economic, legal and environmental uncertainties..." be modified to reflect a sensitivity to long-range ecological effects.

I can't help but raise the moral question as to whether man has the right to change weather patterns. Just as we should respect natural limitations, such as flood plains, in the use of our land, it seems that we would do better to adapt to the uncertainties of weather rather than try to adjust the weather itself. We can point to many unfortunate examples of man's manipulation of natural systems without adequate knowledge, as reflected by saline seep and stream channelization.

However, despite our fears and reservations about weather modification, the Montana Wilderness Association will not oppose the High Plains research program so long as it seeks to identify the total long-range consequences of cloud seeding on our life support system.

Sincerely,

Doris

Doris Milner
President, MWA

C.C. Governor Judge
Senator Mansfield
Senator Metcalf
Representative Shoup
Representative Melcher

APPENDIX D

Weather Modification Site Survey

WEATHER MODIFICATION SITE SURVEY

The information on this questionnaire will be kept strictly confidential. The results will be used only in consolidated form for (a) each of the four areas being surveyed, and (b) for official positions (county commissioner, extension agent, etc.).

1. It would be most undesirable and costly to begin a research program in an area and find a growing resentment to the research. How would you rate the present attitude of county residents toward the research program described in Enclosure 1? (please circle one)

1	2	3	4	5	6
strongly opposed	opposed	neither opposed nor in favor	in favor	strongly in favor	don't know or no opinion

2. Although there is no significant evidence to link cloud seeding with excessive hail, or occurrences such as the Rapid City Flood, some individuals tend to blame weather modification for unusual weather. How would you rate the tendency of county residents to make weather modification a "scapegoat" if an unusual weather occurrence caused local damage?

1	2	3	4	5	6
quick to make it a scapegoat	may make it a scapegoat	neutral	fairly objective and willing to consider facts	quite objective and willing to consider facts	don't know or no opinion

3. The management of the experimental program will require the cooperation and participation of local residents, acting through their selected representatives who would meet regularly with researchers. Such meetings identify potential problems, lead to an understanding of each other's problems, and would result in the establishment of local policies concerning seeding. How would you rate the willingness of county residents to participate in such decision making?

1	2	3	4	5	6
very unwilling	unwilling	indifferent	willing	very willing	don't know or no opinion

4. It is important to know how you as an individual and community leader feel about this research. How do you rate your personal feeling about this research in your area?

1	2	3	4	5	6
strongly opposed	opposed	neither opposed nor in favor	in favor	strongly in favor	no opinion

ENCLOSURE 3

5. Are you aware of any special interest groups in your county, whether organized or not, which might originate active opposition to this research program? (Please circle)

Yes No

If yes, please circle a letter for each such organization without naming it, and check the degree of influence it has in community decision making.

	little influence	moderate influence	considerable influence
A	_____	_____	_____
B	_____	_____	_____
C	_____	_____	_____
D	_____	_____	_____
E	_____	_____	_____

Also, can you suggest anything that might lessen or eliminate their opposition?

_____

6. Are you aware of any special interest groups in your county, whether organized or not, which might originate active support for this research program? (Please circle)

Yes No

If yes, please circle a letter for each such organization without naming it, and check the degree of influence it has in community decision making.

	little influence	moderate influence	considerable influence
A	_____	_____	_____
B	_____	_____	_____
C	_____	_____	_____
D	_____	_____	_____
E	_____	_____	_____

Also, can you suggest anything that might lessen or eliminate their support?

_____

7. Please make any additional comments you wish. (here or on back of page)

8. Please name the county you are residing in _____

9. Please circle your organization

County Commissioner	Soil Conservation Service	County Extension Agent	Mayor

10. If a County Commissioner, please indicate whether this is an

    (a) individual response

    (b) consolidated response from the Board of County Commissioners

11. Please return this form by 25 February 1974 to Dept. of Earth Sciences, Montana State University, Bozeman. A self-addressed envelope is enclosed.

—Montana State University—

Bozeman, Montana 59715 Tel. 406-994-333

Department of Earth Sciences
College of Letters and Science

7 February 1974

Dear Sir:

It is possible that a site in Montana may be chosen for the national weather modification experiment described in Enclosure 1. In anticipation of this possibility, a team from the Montana Department of Natural Resources and Conservation and Montana State University is attempting to select the most suitable site in Montana. Based on criteria established by the Bureau of Reclamation, four areas have been identified as potential sites. The detailed evaluation of these sites, indicated on the map of Enclosure 2, is currently in progress. Because final selection of experimental areas will be made by the federal government during March, it is necessary to complete evaluation of the four Montana sites by the end of February. Your response to the questionnaire (Enclosure 3) by 25 February would be greatly appreciated.

An essential portion of this evaluation will be the consideration of opinions from elected officials and other individuals familiar with the attitudes of the area. This material is being sent to each county commissioner, mayor of a town with population over 1000, Cooperative Extension Agent, and Soil Conservation Service Representative in the cross-hatched counties on Enclosure 2.

Responses from this questionnaire will be the single most significant input in ranking the four sites in priority order. We would very much appreciate receiving a response from each individual receiving a questionnaire, with the exception of county commissioners who may elect to return a single one indicating the consensus of the Board. Please do not duplicate the questionnaire to obtain more opinions for us, because we must compare only the inputs of individuals in comparable positions in each area. You could, of course, get additional opinions for your own use in deciding how you wished to fill out your form.

It is stressed that this is not a popularity contest. Your most objective answers to the attached questionnaire are needed. It would be very wasteful and unfortunate for all concerned if the experiment were started in an area where significant opposition later developed.

A local coordinator has been selected in each of the four areas and his name, position, address, and phone is listed on the map of Enclosure 2. This individual will coordinate publicity and informational meetings for each area. Representatives from the site selection group will be in each area for the two day periods listed on the map. They will be available to meet with groups for the purpose of answering questions or providing additional description of the research program.

Information can also be obtained from Bob Yaw or Arlin Super at Montana State University by calling collect, 994-3331, or from Gerhard Knudsen at the Dept. of Natural Resources and Conservation at 449-3712. Calls will be returned if these personnel are not available at the time of call.

Thank you very much for your assistance.

Sincerely yours,

Arlin Super

Arlin B. Super
Professor of Meteorology

ABS/sja
Enclosures

THE HIGH PLAINS WEATHER MODIFICATION RESEARCH PROGRAM

January, 1974

The Bureau of Reclamation is in the process of selecting two or three experimental areas on the High Plains in which to conduct a long-term, summer cloud seeding research program. It is likely that sites will be chosen to represent the southern, central and northern High Plains. The latter site will probably be in either Montana or North Dakota.

Among the goals of the High Plains Program is the resolution of technological questions which presently surround summer cloud seeding efforts. The intensive research effort is expected to achieve a high level of predictability as to its benefits and effects. The broad objectives of the five-to seven-year research program are to conduct field seeding experiments and evaluations to reduce scientific, economic, legal and environmental uncertainties concerning weather modification. In general, the program is intended to provide the necessary scientific basis for deciding whether or not to embark on operational programs.

Initial field efforts will be directed at individual cumulus clouds to determine which seeding treatments and conditions can lead to rainfall increases or decreases. Since only a few clouds would be seeded on any given day during the first summers, any rainfall changes would be localized. Thus, these experiments would have minimal effect on the total rainfall over the experimental area. Eventually, when the conditions required for rainfall increases are better understood, many suitable clouds over a large area would be treated in attempts to increase the total rainfall. The broad study of possible consequences of weather modification will be closely associated with the cloud seeding investigations.

The experimental program would be a cooperative effort, involving residents of the areas selected for research, officials of state and federal government, and university scientists. It is anticipated that a coordinating committee would be selected by local residents to represent them in planning and conducting the experiments. This committee would be fully aware of research plans and progress, and would insure that seeding operations are not carried out during periods such as harvesting when local residents believed them to be potentially harmful.

The actual research will be performed through contracts with various universities, private firms and governmental agencies. Overall program management and administration will be the responsibility of the Water Resources Division of the Bureau of Reclamation in Denver.

A typical site would have project headquarters and a sophisticated weather radar located at an airport in the center of the experimental area. The airport must have two or more operational runways to permit flight operations under most wind conditions. In order to allow use by well-instrumented, twin engine aircraft at any hour of the day, one runway must be longer than 4,500 feet, paved and lighted. The airport should have a VORTAC navigational system to permit precision control and targeting of the seeding and to monitor aircraft. Although the experimental design is still being developed, it appears that the primary operational area would be circular, having a radius of about 60 miles and include a total area of about 11,000 square miles.

(over)

ENCLOSURE 1

Application of the Bureau of Reclamation criteria to Montana, limits possible experimental sites to the area surrounding Billings, Glasgow, Great Falls and Miles City. Studies which are being conducted by the Department of Natural Resources and Conservation, in cooperation with Montana State University, will establish a priority listing among these four areas. Among the determining factors are:

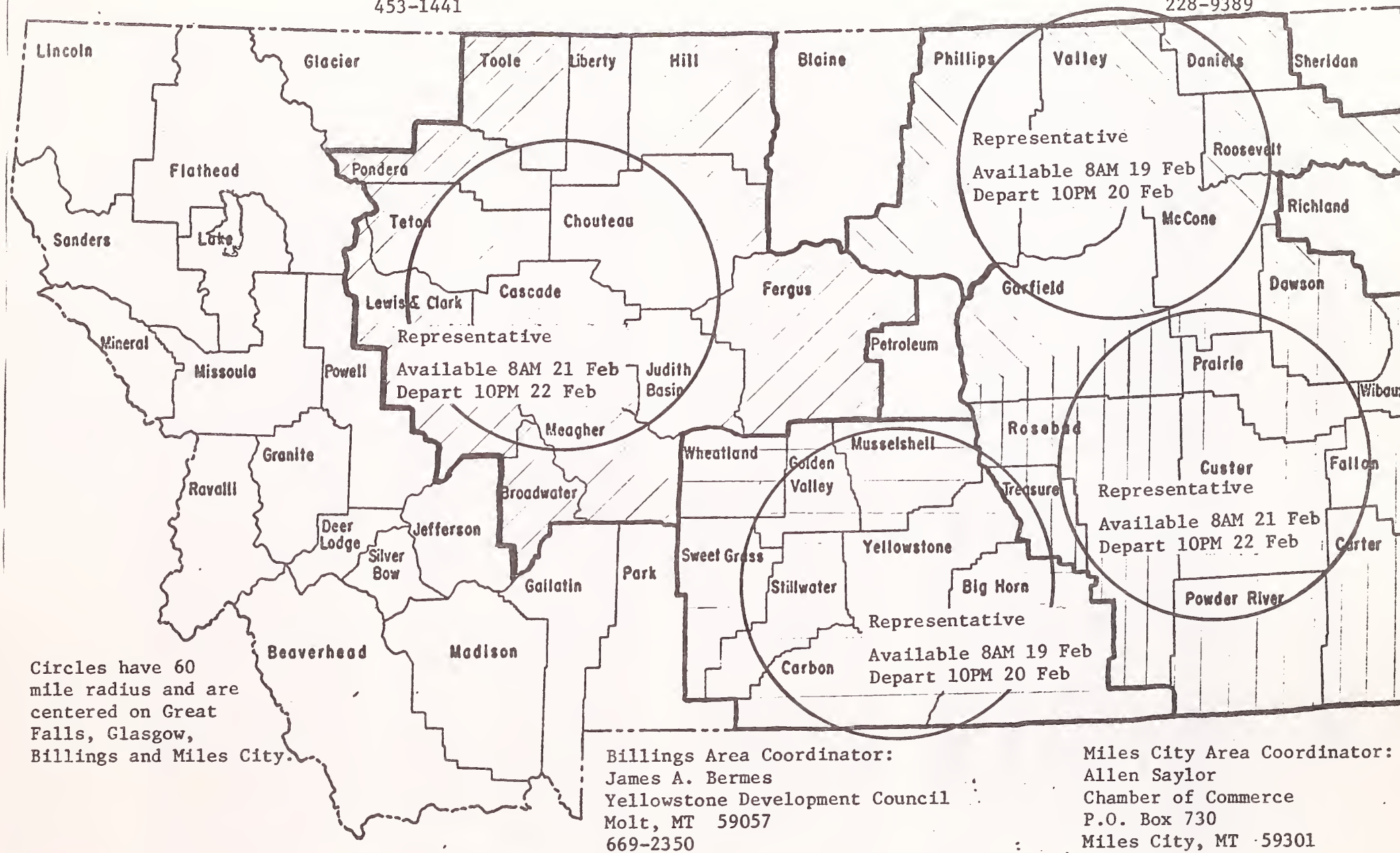
1. attitude of local residents,

2. aircraft operation and maintenance facilities,

3. degree to which the climate at each station is typical of Northern High Plains.

Great Falls Area Coordinator: Art Shew
Chamber of Commerce
P.O. Box 2127
Great Falls, MT 59401
453-1441

Glasgow Area Coordinator: Manson H. Bailey
Valley County Development Assoc
P.O. Box 832
Glasgow, MT 59230
228-9389



Circles have 60 mile radius and are centered on Great Falls, Glasgow, Billings and Miles City.

Billings Area Coordinator:
James A. Bermes
Yellowstone Development Council
Molt, MT 59057
669-2350

Miles City Area Coordinator:
Allen Saylor
Chamber of Commerce
P.O. Box 730
Miles City, MT 59301
232-2890

ENCLOSURE 2

APPENDIX E

Objective Guidelines in Area Determination

OBJECTIVE GUIDELINES IN AREA DETERMINATION
HIGH PLAINS COOPERATIVE PROGRAM

This rating and verification procedure endeavors to provide a rational aid in determining sites for research. Reducing subjective assessments to identifiable factors should help in guiding what promises to be difficult decisions.

The final identification of sites or areas for research will be guided by five basic considerations:

1. An assessment by eight factors to provide relative rating of areas.

2. Verification of four critical requirements for an acceptable program after areas have been tentatively identified and named.

3. Balancing overall program requirements identified in the "Conceptual Plan" with scheduled funding for FY 1974 and FY 1975 and longer range budget outlooks.

4. Where a state has several sites, recommendations by the state will be given priority.

5. General categories of site classification.

For maximum representativeness and acceptability of the findings, research will be conducted in essentially three areas, representative of the climate and crop subregions in the northern, southern, and central Plains States. Specific areas will be grouped and rated by these subregions. This determination procedure contains:

a. Objective assessment for each area proposed by March 1, 1974, of the eight factors will be made and given a point score. A higher score will represent a relatively "better" research area.

b. The four critical requirements will be verified with essentially a "yes-no" acceptability rating. This second or verification part will be finalized after sites have been announced as tentative areas for research and further planning with local groups completed.

The attached summary rating and verification sheet also contains columns for listing state recommendations and the general category of site types.

A. Area Assessment Factors

Note: The overall objectives of the research identified in the "Conceptual Plan" for a High Plains Cooperative Program (May 1973) and unique features of individual areas will be incorporated in the assessments.

1. Local research interest (20 points). - Interest, acceptance and support of local groups and citizens for a 5- to 7-year research program in cooperation with the Bureau of Reclamation is one of the major regards in planning an expensive and important effort. This rating will include consideration of public interest as evidenced in increasing order of involvement by (a) individual and group letters, (b) official resolutions, (c) circulated petitions, and (d) legislative and general election actions. Past experiences with cooperative funding and research support and a concerned, informed press and public will be reflected in the ratings. Evidence on record of existing local organizations supporting the research program will be included in the assessment.

2. State authority (10 points). - Cooperative activities will largely depend upon state legislation or executive orders regarding regulation of cloud seeding activities within a state. The experience, willingness, authority and capabilities of an official agency or commission to take a major, meaningful role in the planned program will be included in assessing this factor.

3. Interstate coordination (10 points). - Higher rating will be assigned areas where program activities would involve several states and where interstate agreements have been arranged.

4. Area needs (5 points). - This factor includes assessment of special water needs, recognition of cloud seeding as a long-range potential and its importance in regional planning, the economic situation in area, and relation to Reclamation projects.

5. Cost sharing (15 points). - Contributions of local or state funds and supportive services, including coordination of operating projects, are important in developing real cooperation and stretching Federal research funds. Assessment will include the overall estimated value of resources offered, existence or degree of offer firmness at time of assessment, flexibility in use, and indications of continuing support for a 5- to 7-year period.

6. Scientific facilities (15 points). - The existence and availability of existing scientific facilities or funded research activities that can be coordinated in the area will reduce overall expenses and give maximum utilization of Federal funds. Availability, capabilities, and interests of scientific expertise in the area will be included in this assessment.

7. Climatology (15 points). - The frequency and type of clouds, moisture availability and estimated rain augmentation potential, and occurrence of weather systems will be assessed in locating project. The large number of test cases needed for analysis favors field experiments where seedable clouds occur more consistently.

8. Representativeness (10 points). - Assessment will be made of the overall High Plains representativeness of terrain features, climatology, water use, cropping and land utilization, and environmental-ecological regimes. How confidently the results from a research area can be extrapolated throughout the High Plains or subregion will be considered.

B. Requirement Verification

1. Minimal adverse environmental or agriculture impacts from a carefully conducted field experiment lasting about five growing seasons.

2. Acceptable local support facilities and logistics for field activities, including personnel aspects.

3. Freedom from perceived active, major opposition to the research including organized opposition from environmental, political, social, or downwind groups and uncoordinated cloud seeding upwind of the area for research.

4. Development of detailed procedures and negotiation of a cooperative agreement or memorandum of understanding.

C. General Area Categories

Sites or areas appear to be of five general types or broad categories. These types listed in decreasing order of overall preference for the proposed research:

SITE DETERMINATION SUMMARY-HIGH PLAINS COOPERATIVE PROGRAM

Specific Sites or Areas Identified as of Mar. 1, 1974 Grouped by sub-regions	State Recommendation	Assessment of Factors by Areas									Requirements Verification				General Type
		TOTAL Maximum 100 Points	1. Local interest	2. State authority	3. Interstate Coordination	4. Area needs	5. Cost sharing	6. Scientific facilities	7. Climatology	8. Represent of Region	Environment	Support Facilities	Opposition Freedom	Agreement	
		Points	20	10	10	5	15	15	15	10	Yes-No				
Northern Plains															
a.															
b.															
c.															
d.															
e.															
f.															
g.															
h.															
i.															
k.															
Central Plains															
a.															
b.															
c.															
d.															
Southern Plains															
a.															
b.															
c.															
d.															
e.															
f.															
g.															

APPENDIX F

Unsolicited Comments

Unsolicited comments were received from the following:

State

Montana Rural Areas Development Committee, Torlief S. Aasheim, Chairman
Valley County Conservation District, Raymond C. Melby, Chairman
North Valley Cooperative Grazing District, Lester S. Johnson, President

County

Glasgow Area
Valley County Commissioners, Howard Cornwell, Chairman
Great Falls Area
Liberty County Commissioners, Troy W. Lakey, Chairman
Toole County Commissioners, John G. Nesbo, Commissioner
Miles City Area
Custer County Commissioners, Victor Kosty, Chairman
Rosebud County Commissioners, Thomas A Deveny, Chairman, Ed McCaffree, Vice Chairman, John W. Moreland, Member
Prairie County Commissioners, Jay Fluss, Chairman
Garfield County Commissioners, Lester D. Engdahl, Chairman, John B. Jordan, Kenneth Coulter
Dawson County Commissioners, Art Dietz, Chairman, Don Gibson, Alvin Mathison
Carter County Commissioners, M. A. Markuson, Chairman

City

Glasgow Area
City Council of Glasgow, James O. Christinson, Mayor
Miles City Area
City of Forsyth, Gene Tuma, Mayor

Organizations

At large
Economic Development Association of Eastern Montana, Calvin J. Oraw, Area Community Development Agent
Glasgow Area
Glasgow Area Chamber of Commerce and Agriculture, Inc., Orville Fjeldheim, Agriculture Committee Chairman, Norris A. Forum, Executive Vice President
Montana Quality Commodities, Inc., James A. Stewart, Vice President and General Manager
Valley County Development Council, Manson Bailey, Jr., Executive Director
Valley County Farmers Education and Cooperative Union of American, Montana Division, Marion Hellstern, Secretary
Valley County Farm Bureau, Lawrence Hlad, President
Tampico Farmers Union, Mrs. Chris Molvig, Secretary
Great Falls Area
Shelby Area Chamber of Commerce, Al Klinger, Secretary-Manager
Miles City Area
Economic Development Council, Wibaux County, James P. Johannes, Secretary
Economic Development Council, Wibaux County, Wayne P. Marcus, Chairman
Miles City Area Chamber of Commerce, Allen Saylor, Executive Director

Petitions

Miles City area
156 Signatures
Glasgow area
77 Signatures
177 signatures

MONTANA STATE RURAL AREAS DEVELOPMENT COMMITTEE

EXTENSION BUILDING MONTANA STATE UNIVERSITY BOZEMAN, MONTANA

RECEIVED

June 15, 1973

TO: Governor Thomas Judge
Gary Wicks

FROM: Torlief S. Aasheim, Chairman
State RAD Committee

RE: Weather Modification Research

The State RAD Executive Committee met in Bozeman on June 13th and discussed among other matters the current status of weather modification research in Montana. The interest among members of the Executive Committee was very high and a motion was unanimously passed indicating this interest and I was instructed to send each of you a letter stating the action taken. The motion made by Keith Williams and seconded by Judd Walker reads as follows:

> "The State Rural Areas Development Committee recommends to the Department of Natural Resources & Conservation and to the Governor of Montana that top priority be given to the support of weather modification research in Montana through participation in the High Plains Cooperative Research Program currently planned by the Bureau of Reclamation".

Members of the Montana Rural Areas Development Executive Committee are: Bernard Harkness, president of the Montana Farm Bureau Federation; Clyde Jarvis, president of the Montana Farmers Union; Jack Iman, president of the Montana Grange, Judd Walker, farmer and rancher and Montana Associated Utilities; Mrs. Sylvia Casey, homemaker and Director, Montana Safety Foundation; Gordon Twedt, farmer, rancher and businessman; Robert Raundal, Department of State Lands; Keith Williams, Montana Power Company; Dick Setterstrom, farmer, rancher, retired; and Torlief Aasheim, Director of the Montana Cooperative Extension Service, and chairman of the Committee.

All of the above named members were in attendance at this meeting except Gordon Twedt and Bernard Harkness. Stan Burger who is Mr. Harkness' alternate on the committee was in attendance.

TSA:fmp
cc: State RAD Executive Committee & Alternates
State USDA Committee for Rural Development
Dorothy Eck
Douglas Smith
George Lackman
J. A. Asleson
Jim Stephens
Robert Brastrup

Issued in furtherance of cooperative extension work in agriculture and home economics; acts of May 8 and June 30, 1914, in cooperation with the United States Department of Agriculture. Torlief S. Aasheim, Director of Montana Extension Service, Montana State University, Bozeman, Montana.

VALLEY COUNTY CONSERVATION DISTRICT
219 SECOND AVENUE SOUTH
GLASGOW, MONTANA 59230
PHONE: 228-9042

OUR SOIL ★ OUR STRENGTH

January 9, 1974

RECEIVED
JAN 10 1974
MONT. DEPT. OF NATURAL RESOURCES & CONSERVATION

Mr. Gary Wicks, Director
Montana Dept. of Natural Resources & Conservation
Sam W. Mitchell Bldg.
Helena, Montana 59601

Dear Mr. Wicks:

The Valley County Conservation District wish to advise they are in favor of obtaining the Weather Modification Research program currently being considered for this area.

We feel that Valley County is well situated and has available the necessary facilities to handle the Weather Modification program and we will cooperate to the fullest extent to make it a successful venture.

Thank you for your consideration of Valley County in this matter.

Very truly yours,

Raymond C. Melby

Raymond C. Melby, Chairman
Valley Co. Cons. District

cc: Manson H. Bailey, Jr. Chairman
Valley Co. Development Council

MONT. DEPT of NATURAL
RESOURCES & CONSERVATION

WHEREAS, Valley County, Montana, and surrounding area is interested in furthering the knowledge and effects of weather modification through cloud seeding to increase rainfall;

WHEREAS, the United States Bureau of Reclamation in cooperation with states and communities is planning an extensive scientific research program known as "High Plains Weather Modification Research Program;"

WHEREAS, Montana is being considered as one of the states where such a research site may be located;

WHEREAS, the Glasgow City-County Airport (a former B-17 Bomber training field in WW II) has the qualifications to support aircraft used in such operations, plus a U.S. Weather Bureau Station located on the installation with rawinsonde release designation and back-up facilities at the Glasgow Air Force Base;

WHEREAS, an application was submitted with a good representative cross section of support from city and farm-ranch organizations, as well as governing bodies, to have such a site located here;

WHEREAS, this semi-arid area, which is typical of the high plains region, is dependent upon agricultural resources from the land and the moisture it receives;

NOW, THEREFORE, BE IT RESOLVED, that we the undersigned individuals and organizations, after having been briefed in the Valley County Courtroom on the proposed program by a Professor of Meteorology from the Dept. of Earth Sciences, Montana State University, do support the program and further recommend that Montana be selected as the state, with Glasgow and northeast Montana as the site location and further that copies of this resolution be directed to the Montana Congressional Delegation, the

Secretary of the Interior, and the Bureau of Reclamation, the Office of the Governor of the State of Montana, the Director of Montana Department of Natural Resources and Conservation, and the Department of Earth Sciences, Montana State University.

BROUGHT, PASSED AND ADOPTED this 19th day of February, 1974.

BOARD OF COUNTY COMMISSIONERS
VALLEY COUNTY

Chairman

VALLEY COUNTY DEVELOPMENT COUNCIL

President

CHAMBER OF COMMERCE AND AGRICULTURE - Glasgow

Executive Vice-President

VALLEY COUNTY FARM BUREAU

President

MONTANA QUALITY COMMODITIES

President

VALLEY COUNTY FARMERS UNION

President

VALLEY COUNTY SOIL CONSERVATION DISTRICT

President

NORTH VALLEY COOPERATIVE GRAZING DISTRICT

President

Board of County Commissioners
Valley County

GLASGOW, MONTANA

EARL DALEY, Chairman
JOHN MAXNESS
HOWARD CORNWELL

MARY LOU EIDE, CLERK

January 14, 1974

Mr. Gary Wicks, Director
Montana Dept. of Natural Resources
and Conservation
Sam W. Mitchell Bldg.
Helena, Montana 59601

Dear Mr. Wicks:

The Board of County Commissioners feel Valley County would be very well situated to handle the Weather Modification Research program which is being considered for this area.

This is to advise you we are in favor of this project and would be willing to cooperate in any way.

Very truly yours,

Howard Cornwell

Howard Cornwell, Chairman
Board of County Commissioners

Mle

COUNTY OF LIBERTY

STATE OF MONTANA
CHESTER, MONTANA 59522

TROY W. LAKEY Chairman
J. H. McDOWELL
ORVAL L. BRAIN Commission
DORA HEIMBIGNER Clerk & Rec
ALMA SOPER Deputy

February 1, 1974

Department of Natural Resources
32 South Euing
Helena, Montana 59601

Dear Sir: Subject: Project Skywater

I, Troy W. Lakey, Chairman of the Board of County Commissioners, Liberty County, Montana urge your support in favor of "Project Skywater " a High Plains Cooperative Weather Modification Program for Montana.

Project Skywater is the U. S. Dept' of Interior's research program on seeding clouds for augmenting water supplies.

This project will be conducted through the Bureau of Reclamation and has been endorsed by the Triangle Area of Northern Montana. Once again we urge your support.

Sincerely,

Troy W Lakey

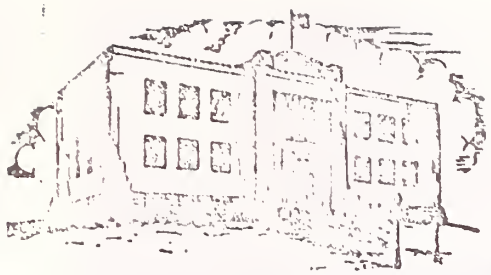
Chairman, Board of County Commissioners
Liberty County, Montana.

cc: Governor Judge
Mike Mansfield-U.S. Senator
Richard Shoup-Congressman
John Melcher-Congressman
Lee Metcalf-U.S. Senator

RECEIVED
FEB - 1974
DEPT. OF NATURAL RESOURCES & CONSERVATION

SK SR., Chairman
T A. TOMSHECK, Commissioner
G. NESBO, Commissioner
. KALBFLEISCH, Attorney
ETTE E. McDONALD, Clerk and Recorder
L. BROOKS, Sheriff

VIVIAN S. HALL, Clerk of Court
MARY E. WESTERMARK, Treasurer
MARIE A. ADAMS, Assessor
SHARRON L. WEATHERSON, Co. Supt.
ROBERT E. BURNS, Coroner
P.J. JACQUEMART, Public Administrator



COUNTY OF TOOLE

SHELBY, MONTANA

Jan. 3, 1973

Honorable Thomas L. Judge
Governor of the State of Montana
Helena, Montana

Dear Governor Judge:

We are very interested in seeing, "Operation Sky Water", funded and put into operation in Montana.

Many Farmers in our area have been interested in Weather Modification for quite some time.

Farmers, Ranchers and other interested citizens of our Nine County Area, recently formed a group called "Tri-Rain". There is a great deal of interest in this Triangle Area, which is composed of Glacier, Toole, Liberty, Hill, Blaine, Choteau, Cascade, Teton and Pondera. Five of these Counties were declared Disaster Area Counties in 1973, because of drought in 1972 and 1973.

Naturally because of our interest and location we think the Triangle Area would be an ideal spot for the "Sky Water Project".

There is no fair or practical way of funding local weather modification projects as yet, but I am sure "Operation Sky Water" would prove we can increase rainfall, then I know the general public would back weather modification programs which would in turn boost our economy.

We sincerely urge your support of this project.

For increased rainfall I am,

Sincerely yours,

John G. Nesbo, Toole County Commissioner

OFFICERS

L. I. Nance.....Clerk and Recorder
Marjorie H. Kraudy.....Clerk of Court
Dorothy E. Stabler.....Treasurer
Harold D. Hilderman.....Assessor
Francis W. Damm.....Sheriff
William J. Krutzfeldt.....Attorney
Irma L. Schaefer.....Supt. of Schools
J. F. Doyle.....Public Admin.
Dale M. Stevenson.....Coroner

BOARD OF
COUNTY COMMISSIONERS

Gordon Spears..... Chairman
Victor Kosty .....Member
John Beardsley .....Member

MILES CITY 59301
December 21, 1973

RECEIVED
DEC 27 1973
WATER & CONSERVATION

Dr. Archie Kahan, Chief
Division of Atmospheric Water Resources Mgmt.
Bureau of Reclamation
U. S. Dept. of the Interior
Denver, Colorado 80225

Dear Sir,

The Commissioners of Custer County give their whole hearted support to Project Skywater.

We feel that research over a period of several years would show what results might reasonably be expected by cloud seeding.

Very truly yours,

Victor Kosty

Victor Kosty, Chairman
Custer County Commissioners

VK/dw
cc/Gary Wicks - Dept. of Natural Resources
Helena, Montana

cc/Chamber of Commerce
Miles City, Montana

COUNTY OF ROSEBUD
office of
COMMISSIONERS
FORSYTH, MONTANA

RECEIVED
FEB - 8 1974

Thomas A. Deveny, Chairman
Ed McCaffree, Vice Chairman
John W. Moreland, Member

February 7, 1974

Gary Wicks
Dept. of Natural Resources
Helena, Montana

Dear Sir:

From what we now know of the weather modification research project, known as Project Skywater, we wish to inform you that we believe this endeavor to be very worthwhile.

We understand that an area within a seventy mile radius of Miles City is under consideration for a location. This we feel would be accepted by the local people as a benificial project and information obtained could be very worthwhile.

Sincerely yours,

Rosebud County Commissioners

Thomas A. Deveny

Ed McCaffree

John W. Moreland

« Office of »

CLERK AND RECORDER

PRAIRIE COUNTY, MONTANA

Terry, Montana

January 9, 1974

RECEIVED
JAN 10 1974
MONT. DEPT. of NATURAL RESOURCES & CONSERVATION

Dr. Archie Kahan, Chief
Division of Atmospheric Water Resources Mgmt.
Bureau of Reclamation
U.S. Dept. of the Interior
Denver, Colorado 80225

Dear Sir;

The Commissioners of Prairie County feel that Project Skywater could be beneficial to our community and therefore give their support to this project.

Sincerely,

Jay Fluss, Chairman
Prairie County Commissioners

cc/Gary Wicks - Dept. of Natural Resources
Helena, Montana

cc/Chamber of Commerce
Miles City, Montana

GARFIELD COUNTY COMMISSIONERS

RECEIVED
JAN 1 1974
MONT
RESOURCES

JORDAN, MONTANA
January 9, 1974.

Dr. Archie Kahan, Chief
Division of Atmospheric Water Resources Mgmt.
Bureau of Reclamation
U. S. Dept. of the Interior
Denver, Colorado 80225

Dear Sir:

From what we now know of the weather modification research project, known as Project Skywater, we wish to inform you that we believe this endeavor to be very worthwhile.

We understand that an area within a seventy mile radius of Miles City is under consideration for a location. This would encompass a large area of southeastern Garfield County. This we feel would be accepted by the local people as a benificial project and information abtained could be very worthwhile.

Sincerely yours,

Lester D. Engdahl
Lester D. Engdahl, Chrm.

John B. Jordan
John B. Jordan

Kenneth A Coulter
Kenneth Coulter

cc/Chamber of Commerce
Miles City, Montana

cc/Gary Wicks
Dept.of Natural Resources
Helena, Montana

RECEIVED
JAN 15 1974
MONT. DEPT. of NATURAL
RESOURCES & CONSERVATION

January 14, 1974

Dr. Archie Kahan, Chief
Division of Atmospheric Water Resources Management
Bureau of Reclamation
U. S. Department of the Interior
Denver, Colorado 80225

Dear Dr. Kahan:

Enclosed herewith please find copies of letters from two more counties expressing their support of a weather modification research site at Miles City, Montana.

Having contacted the ten counties within a 70 mile radius of Miles City and already having received favorable backing from over half of the commissioners at this time, we feel very confident that our area is the type of region which can and would lend itself to a successful weather modification research site.

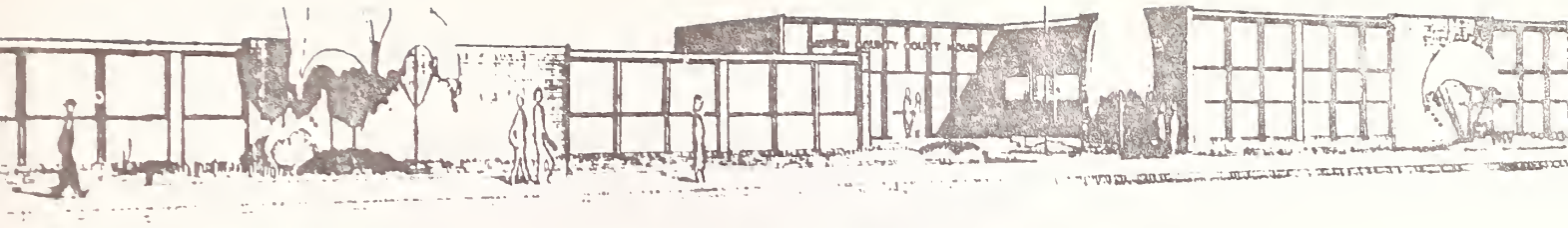
Local interest continues to build and we look forward to a favorable decision for eastern Montana.

Sincerely,

L. R. Erickson
Chairman - Weather Modification Committee

LRE:jb
cc: Gary Wicks - Director
Dept. of Natural Resources and Conservation
32 South Ewing
Helena, Montana 59601

Allen Saylor - Exec. Director
Miles City Area Chamber of Commerce



OFFICE OF:
COUNTY COMMISSIONERS

COUNTY OF DAWSON
GLENDIVE, MONTANA 59330

P. O. Box 281
Phone 365-3562

January 7, 1974

Miles City Area
Chamber of Commerce
P.O. Box 730
Miles City, Mont na 59301

Dear Sir:

You may add us to your list of those who support your efforts to secure project Skywater for the Miles City area.

Even tho no additional rainfall may result or that hail potential may not be suppressed, the information gathered could be of great benefit to all of Eastern Montana.

Sincerely,

BOARD OF COUNTY COMMISSIONERS

Art Dietz

Art Dietz, Chairman

Don Gibson

Don Gibson, Member

Alvin B. Mathison

Alvin B. Mathison, Member

Board of

County Commissioners

Carter County, Montana

Ekalaka, Montana

59324

January 8, 1974

Chamber of Commerce
Box 730
Miles City, Montana 59301

Dear Mr. Erickson:

The Board of County Commissioners of Carter County wish to offer our support for a weather modification research site to be located near Miles City and will try to cooperate with the project as well as possible.

Yours very truly,

BOARD OF COUNTY COMMISSIONERS
CARTER COUNTY, MONTANA

M. A. Markuson

M. A. Markuson, Chairman

RESOLUTION IN SUPPORT OF THE
HIGH PLAINS WEATHER
MODIFICATION RESEARCH PROGRAM

WHEREAS, the City Council of the City of Glasgow, Montana, has duly met in regular session on the 20th day of February, 1974, at which time the City Council discussed the High Plains Weather Modification Research Program;

BE IT RESOLVED that upon being apprised of plans by the U.S. Bureau of Reclamation to establish a test site with the purpose of carrying out scientific research in weather modification to close the existing information gap necessary to effectively use cloud seeding to increase rain as well as other effects of it, that we do favor this and further request that Montana be selected as the state in the northern region in which to carry out such an experiment;

AND BE IT FURTHER RESOLVED that should Montana be selected for this purpose, that the site headquarters be located at the Glasgow City-County Airport (a former B-17 Bomber training base in World War II) which has the necessary facilities to adequately serve the aircraft which would be used in such research, plus the presence of a U. S. Weather Bureau Station at the same location, which is also designated as a release point for rawinsonde observations used in proposed research program.

NOW THEREFORE, BE IT RESOLVED BY THE CITY COUNCIL OF THE CITY OF GLASGOW, MONTANA that the community having been briefed by technical personnel from Montana State University on the proposal, that we do fully support the program, and that copies of this resolution be directed to the Montana Congressional Delegation, the Secretary of the Interior, and the Bureau of Reclamation, the Office of the Governor of the State of Montana, the Director of Montana Department of Natural Resources and Conservation, and the Department of Earth Sciences, Montana State University.

UNANIMOUSLY PASSED AND ADOPTED this 20th day of February, 1974.

James O. Christiansen
Mayor

ATTEST:

Barbara M. Fow
City Clerk

City of Forsyth
State of Montana

OFFICE OF Mayor

Dr. Arlin Super
Professor of Meteorology
Montana State University
Bozeman, Mt. 59715

Dear Sir;

This is to notify you that at our city council meeting of Feb. 25 we discussed the proposed Sky Water Project for the Miles City area and agree that any project which has a possibility of increasing the precipitation in our area is definitely a project that we support.

The people of Forsyth and the surrounding area of Rosebud County have been questioned and informed about the program and the possibility of modifying the severe summer storms which sometimes cause a great deal of damage to growing crops. To a man, they favor anything which has the potential for limiting the destructive forces of hail.

Please accept this letter instead of the questioneer which the Miles City Area Chamber of Commerce claims that we should have received from your office. It did not arrive here.

Sincerely yours,

Gene A. Tuma

Gene Tuma, Mayor

GT/es

ECONOMIC DEVELOPMENT ASSOCIATION

OF EASTERN MONTANA

Box 388
Sidney, MT 59270
Tele: 482-3035
January 15, 1974

RECEIVED
JAN 16 1974
MONT. DEPT. of NATURAL RESOURCES & CONSERVATION

District 1
Phillips
Valley
Daniels
Sheridan
Roosevelt

District 11
Petroleum
Garfield
McCone
Richland
Dawson
Prairie
Wibaux

District 111
Rosebud
Treasure
Custer
Fallon
Carter
Powder River

Mr. Gary Wicks, Director
Department of Natural Resources
Mitchell Bldg.
Helena, MT 59601

Dear Gary:

The Economic Development Association of Eastern Montana has been informed that the High Plains Cooperative Weather Modification Research Program site that will be located in either Montana, North Dakota, or South Dakota will be selected in the latter part of March or early April and we would like to know what your department has been doing lately about encouraging the location of the multi-million-dollar field research site in eastern Montana.

We have been told that North Dakota has suggested four possible locations for the research site in their state and we are concerned that without the proper preparation and support Montana will not be chosen to share in the program.

The controversy over the Hungry Horse Applications points out the need for more research information if Montana is to deal rationally with applications for operational Weather Modification Projects.

If we can help you promote eastern Montana as the area for the Weather Modification Research Site, please contact us.

Best regards.

Sincerely,

Calvin J. Oraw
Area Community Development Agent

CJO:amb

CHAMBER OF COMMERCE & AGRICULTURE, INC.
Glasgow AREA
BOX 832 GLASGOW, MONTANA 59230
TELEPHONE (406) 228-2222

Mr. Gary Wicks, Director
Mont. Dept. of Natural
Resources & Conservation
Sam. W. Mitchell Bldg.
Helena, Montana 59601

Dear Mr. Wicks:

The agricultural committee of the Glasgow Area Chamber of Commerce & Agriculture is in favor of the development of the weather modification research program for this section of Montana.

We believe this arid area could benefit greatly and is i-dealy suited to this research.

Our contacts with farmers and livestock ranchers have all been in favor of the research projects and we have received no un-favorable comments.

There already are several grass seeding, rotation grazing, and club moss control projects throughout this area and the Glasgow Area Chamber of Commerce & Agriculture is of the opinion that the weather modification research would fit well with existing exper-iments and is looking forward to more explanation when a Bureau of Reclamation representative will be touring the respective areas in February.

Sincerely
Glasgow Area Chamber of
Commerce & Agriculture
Ag. Committee Chmn.
Orville Fjeldheim

Orville Fjeldheim Chmn

Exec. Vice Pres.
Norris A. Forum

Norris A. Forum

ACCREDITED
CHAMBER OF COMMERCE

Post Office Box 1[illegible]

Telephone (406) 228 8291

MONTANA QUALITY COMMODITIES, INC.

HIGH PROTEIN WHEAT PREMIUM FEEDER CATTLE
OTHER LIVESTOCK AND FEED GRAINS

121 THIRD STREET SOUTH, GLASGOW, MONTANA 59230

January 14, 1974

Mr. Gary J. Wicks, Director
Montana Department of Natural
Resources and Conservation
Sam W. Mitchell Building
Helena, Montana 59601

Dear Gary:

Montana Quality Commodities comprises key farmer, stockman and business leaders in 12 counties and is directed to agricultural development, rural business development and improvement of area economy.

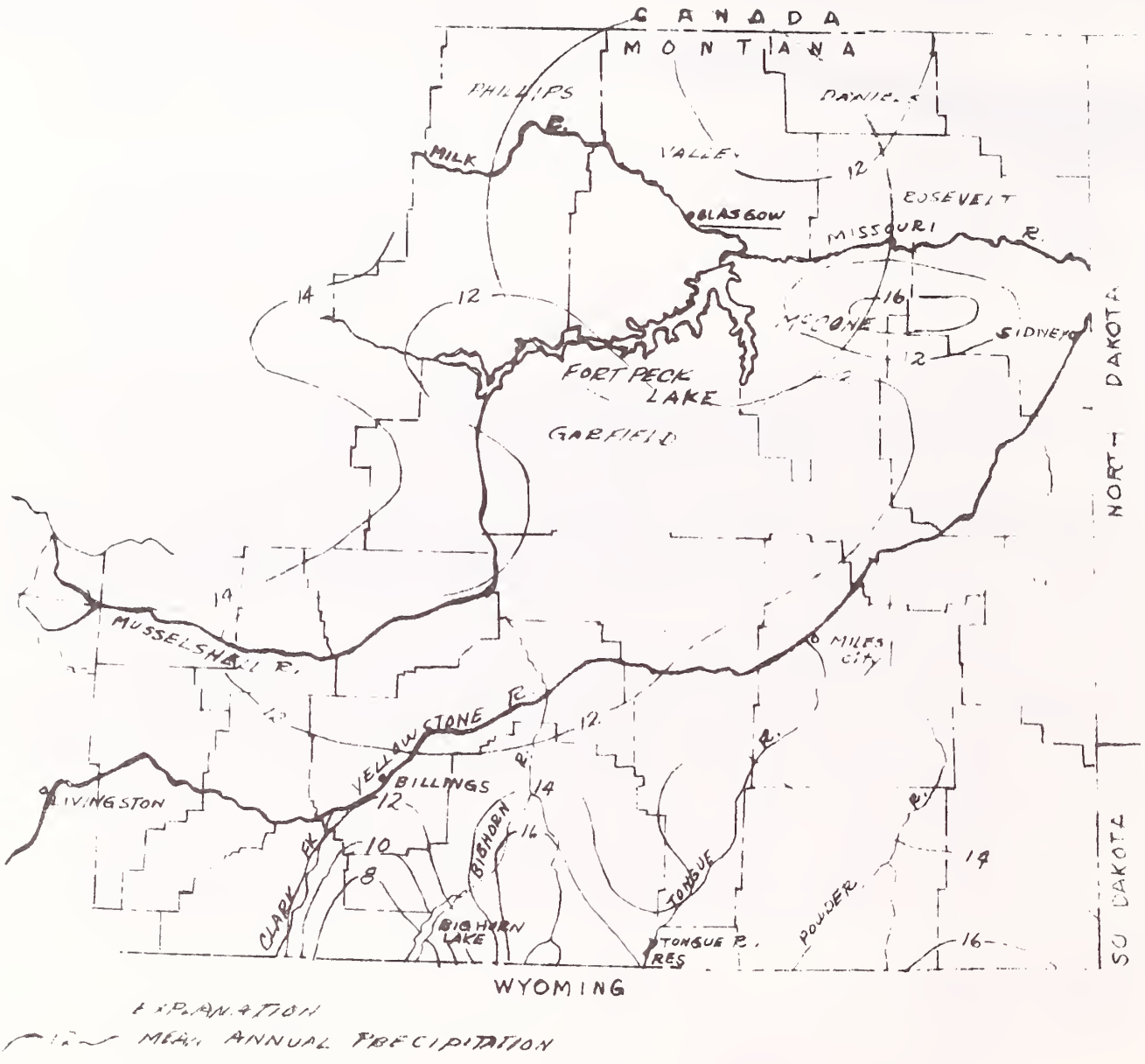
We urge that the U. S. Bureau of Reclamation's weather modification experimental program be located in Montana in preference to the Dakotas because of more arid conditions that prevail in our principal agricultural areas and because of the importance to all downstream users of increased precipitation at the headwaters of the Missouri river.

We urge further that the project be located in the Glasgow area because of our low annual precipitation and the greater potential contribution to the economy of the state from increased precipitation on our larger amount of dry cropland acres.

Yours truly,

J. A. Stewart

James A. Stewart
Vice President &
General Manager



EASTERN MONTANA

Valley County Development Council

First National Bank Building, Suite 105
Post Office Box 832
Glasgow, Montana 59230
Tel: (406) 228-9389

RECEIVED
JAN 15 1974
MONT. DEPT. of NATURAL RESOURCES & CONSERVATION

January 9, 1974

Mr. Gary Wicks, Director
Dept. of Natural Resources & Conservation
Mitchell Building
Helena, Montana

Re: High Plains Cooperative Program
Weather Modification

Dear Mr. Wicks:

Valley County and this section of Montana have had a great interest in the proposed weather modification program which we understand will be initiated somewhere within the three-state area of North Dakota, South Dakota or Montana.

We are most hopeful that Montana will be chosen for the site. Our area of Northeast Montana has long been interested in the proposal and was first in contact with it through the proposal of the National Oceanic & Atmospheric Administration (NOAA) in the summer of 1972.

Should Montana be selected as the state where this experimental program is to be carried out, we submit, in behalf of the people and organizations of Valley County, our application to have Glasgow designated as the headquarters for such an operation.

On January 7, 1974, our organization held a quarterly open meeting with some 50 people in attendance. There was a good cross-section of County organizations represented. Also agencies such as Corps of Engineers, SCS, Fish and Game, BLM, ASCS, FHA, Rural Electric & Telephone, Extension Service, etc., were represented.

After a presentation and discussion of the proposal, a motion was duly presented and fully supported to submit this application.

Enclosed please find information supporting our bid for location at Glasgow for the benefit of the area which we understand will cover a radius of 60 miles, or 120 miles across. We feel it presents a good case.

Asking that you and those who will be making such a decision give this area very serious consideration. Thanking you for this,

Sincerely,

Manson Bailey, Jr.

Manson Bailey, Jr.
Executive Director

ad

Keep Valley County Growing

SKY WATER

ATMOSPHERIC WATER RESOURCE MANAGEMENT

Points of consideration to locate a proposed weather modification station in Montana and more specifically in northeast Montana at Glasgow, which would include Valley County and parts of Phillips, Roosevelt, Daniels, McCone, and Garfield Counties.

Headquarters -- Glasgow City-County Airport, with back-up facilities of the Glasgow Air Force Base, seventeen miles to the north, or vice-vera, whichever would best meet the requirements.

Facilities at Glasgow City-County Airport:

1. If aircraft are to be used, there are two runways -- elevation 2293, runway 12 and 30 is 6000 feet long, runway 7 and 25 is 5000 feet long, both paved and lighted (former B-17 training Base WW II)

2. A U.S. Weather Bureau Station is located at the airport. They are voluntarily jointly manning the local Unicom Radio Communications with the Base Operator (The Wokal Flying Service)

3. Located on northern perimeter of Glasgow, ready access to personnel

4. Aircraft Radio Navigation Facilities:

    a. a VOR (113.9 Mhz)
    b. a Home (339 Mhz)
    c. a Remoted Radio Communications facility to the Great Falls Air Traffic Control or ATC on 125.00 Mhz
    d. a Remoted Radio Communications facility to the Miles City FAA Station on 123.6 Mhz
    e. a local telephone number (228-2751) for direct access to the Miles City FAA Station for flight planning, and pilot briefing
    f. A DME (Distance Measuring Equipment) capability is available by tuning 112.6 which is the Glasgow Air Force Base Tacan
    g. a good alternate Airport at the Glasgow Air Force Base which offers DME and ILS and a control tower during regular working hours
    h. Glasgow has a published Instrument Approach chart for VOR approaches and ADF approaches can also be made on the homer. There is also a radio broadcast station (1240) which can be used for in-flight ADF work and homing.

It has been mentioned that Glasgow is served by Frontier Airlines. There is a flight west terminating at Great Falls each day and also a flight east which terminates at Minot, N.D.

Glasgow also has an aggressive fixed Base Operator in the Wokal Flying Service which has instrument-rated pilots and Flight Instructors, and has built up a good flight charter business in the area.

There is a new Aircraft and Engine shop on the airport which is owned and operated by Wally Peterson (A&P, etc.) and another aircraft mechanic.

ADDITIONAL AREA DATA

PROPOSED HIGH PLAINS COOPERATIVE PROGRAM

Northeast Montana is a semi-arid area with a mean average precipitation of 12 inches (this is lower than the other areas being considered in Montana).

General physical characteristics -- considered plains area ranging from level land and undulating glacial drift to moderately sloping, to hilly land. Traversed by the Milk and Missouri Rivers with large Fort Peck Dam and Lake located within the area.

Average annual runoff in inches per unit area -- 0.5.

Crops grown are wheat, barley and oats on the uplands or dryland farming areas, with hay, corn for silage and some grains on the irrigated river bottoms. A considerable portion of the area is devoted to livestock grazing.

Served by U.S. Highway No. 2 East-West, and No. 247 North to Canada and No. 24 south. Mainline of Burlington Northern R.R. with AMTRAK service w/one train each way daily.

Also served by Radio KLTZ -- 1240 -- in Glasgow; cable and translator TV; the Glasgow Courier, a weekly publication; and Western Union Telegraph.

DESIGNATED REDEVELOPMENT AREA

Valley County is a designated Redevelopment Area due to the closure of the large Glasgow Air Force Base in 1968 and economic stress which followed.

Valley County led the State in out-migration from 1960 to 1970, losing 1/3 of the population (32.8%) see OEDP page 20.

The Valley County Development Council was formed as an entity of County Government and is partially funded through the Economic Development Administration.

The County does have an Overall Economic Development Program (OEDP) which is updated annually.

Weather modification is listed in the plan as one of the goals -- see page 36 of OEDP.

There is presently a county-wide soil survey in progress with about 3/4 of the land surveyed to date, providing good information back-up.

City of Glasgow has had a City-County Planning Board for the past 10 years and is operating under a Comprehensive Master Plan.

The Glasgow Air Force Base is an ideal alternate site, or back-up, with a 13,500' runway, tower and landing equipment, adequate housing, and self-contained community.

The Glasgow Chamber of Commerce and the Farm and Ranch organizations of the County are progressive and have good leadership.

VALLEY COUNTY
Farmers Educational & Co-operative Union
of America
MONTANA DIVISION

Box 447, Hinsdale, MT 59241
Feb. 21, 1974

The VALLEY COUNTY FARMERS UNION urges that the Glasgow area be designated for weather modification research.

Marion Hellstern, Secretary
Valley County Farmers Union

FEB 25 1974

Jampico Mont
Feb. 25, 1974

Mr. Gary Wicks
Helena. Mont.

Dear Mr. Wicks.

We are some of the people in Valley County, Montana that would like to have Glasgow, Montana designated as the location for the proposed weather modification project.

Sincerely

Jampico Farmers Union

Mrs. Chris Mahrt
Sec

SHELBY — "GATEWAY TO ALASKA"

Shelby Area Chamber of Commerce

P. O. BOX 488 PHONE 434-2031

Shelby, Montana

59474

1/3/74

January 2, 1974

Honorable Thomas Judge
Governor of the
State of Montana
Helena, Montana

Dear Governor Judge:

We are writing this letter to urge your support and cooperation in the weather modification program indentified as "Operation Sky Water". This program is being initiated by the Bureau of Reclamation".

The Bureau is presently involved in the Site Selection part of the program. Our Triangle Area, composed of nine counties here in Northern Montana seeks to have the Bureau designate this Northern Montana Area as the best site, for this weather modification experiment.

As you know the funds have already been approved for this program of weather modification. We feel that Northern Montana having just experienced the driest year on record, makes a perfect area for this experiment.

Yours sincerely,

Dick Potter, President
by Al Klingler, Sec-manager

Al Klingler

Mr. [illegible], Chief
[illegible] Atmospheric Water
Resource Management
Bureau of Reclamation
United States Department of Interior
P. O. Box 25007
Denver, Colorado 80225

Dr. Kahan:

Just got back from the Montana meeting on Project Sky Water and had an interesting visit with Pat Hurley.

While we were comparing correspondence from my file with what you had received, we noted several communications that you do not have. They are enclosed.

We are presently soliciting the support of our County Commissioners and those from surrounding counties. If anything develops prior to the community meetings for this area, we will let you know as soon as possible.

It appears at this time that many groups are willing to lend support to the research project, but are waiting for guidance or a community meeting for more in-depth information from your people.

Sincerely,

Allen Sallee, Executive Director
BILLINGS CITY AREA CHAMBER OF COMMERCE

AS:rh

cc:
Roy Erickson, Chamber Weather Modification Chairman
Gary Wicks, Director Department of Natural Resources and Conservation

enc.

RECEIVED
DEC 7 1973
MONT. DEPT. of NATURAL RESOURCES & CONSERVATION

Wibaux, Montana
December 6, 1973

Gary Wicks, Director
Montana Dept. of Natural Resources & Conservation
Sam W. Mitchell Bldg.
Helena, MT. 59601

Dear Gary:

Due to the distances involved and the timing in relation to local activities, the Economic Development Council of Wibaux County will be unable to provide representation at the December 18th meeting.

We do, however, want to relay to the meeting that there is a great deal of interest supporting Weather Modification research in Wibaux County. There has been much interest, not only from the Economic Development Council, but also from farmers and ranchers, County Commissioners, Conservation District Supervisors and our local Committee for Rural Development, and all of this interest has been in support of Weather Modification research and can be substantiated by meeting minutes and previous letters written to your Department.

We trust that this support will be recognized and we are anticipating subsequent meetings in our area in furtherance of this effort.

Sincerely,

James P. Johannes, Secretary
Economic Development Council
Wibaux County
Wibaux, MT. 59353

JPJ:emp

Wibaux, Montana
February 2, 1973

Gary Wicks
Department of Natural Resources
Mitchell Building
Helena, Montana 59601

Dear Mr. Wicks:

We believe that Montana needs the knowledge that can come from Weather Modification Research. In order to obtain the means of getting this knowledge, we would like to see some changes in the state law. An agency should be charged with finding out just what cloud seeding can do for Montana agriculture, the necessary funds need to be appropriated for administering the law and the rigid requirement for expensive public hearings should be modified to allow cooperation with neighboring states.

We further support a change in the law to allow the formation of Weather Modification Districts for increased rainfall and hail suppression.

Sincerely,

Wayne L. Francis
Chairman

Directors: James J. Johannes
Margaret Jakmon
W. L. Kozanek
Harry Bedder
Warren E. Meyer
Frank V. Fatta

Economic Development Council
of Wibaux County

SITE SELECTION MEETING

MILES CITY, MONTANA 59301
February 21, 1974

We, the undersigned, believe the Weather Modification Research Program known as "Project Skywater" to be of possible future benefit to our area and to our agricultural economy.

We, therefore, give our support to this project.

NAME	~~ADDRESS~~ City	NAME	~~ADDRESS~~ City
[illegible]		Elliot Taylor	Rocky Sp[illegible]
[illegible]		E.A. Allen	Miles City
Tom [illegible]		Hugo Muggli	Miles City
Russ [illegible]		[illegible]	[illegible]
[illegible]		Donald [illegible]	
[illegible]		L.R. [illegible]	Miles City
[illegible]		Robert J. Peacock	Miles City
Tom [illegible]		[illegible]	
[illegible]		[illegible]	
[illegible]		R.B. [illegible]	M.C.
[illegible]		[illegible]	M.C.
[illegible]		[illegible]	Miles City
R.L. Reigman	Miles City	[illegible]	Miles City
[illegible]	Prairie County	Jerry McKeen	Miles City
[illegible]		[illegible]	[illegible]
[illegible] Chapman		E.C. Kimball	Miles City
J.C. Montoya		R.C. Brown	Miles City
Tom W. [illegible]		[illegible]	
[illegible]		[illegible]	
[illegible]		[illegible]	
[illegible]	[illegible]	J. Wiseman	
Carl E. [illegible] Jr.		[illegible]	
[illegible]		[illegible]	
John [illegible]		[illegible]	

SITE SELECTION MEETING

MILES CITY, MONTANA 59301
February 21, 1974

We, the undersigned, believe the Weather Modification Research Program known as "Project Skywater" to be of possible future benefit to our area and to our agricultural economy.

We, therefore, give our support to this project.

NAME	~~ADDRESS~~ City
[illegible]	Miles City
[illegible]	Miles City
[illegible]	Miles City
Kenneth Rustad	Baker
[illegible]	Baker
George Gray	Miles City
[illegible] "Pat" [illegible]	Volborg
[illegible]	Volborg
[illegible]	Miles City
Mrs J B Mathews	"
[illegible]	"
[illegible]	Miles City, Mt.
[illegible]	Miles City
[illegible]	Miles City Mt.
[illegible]	Miles City, Mt.
[illegible]	Miles City
Mrs Conrad H. Milton	M C
Harvey J Milton	Miles City
[illegible]	M.C
[illegible]	Miles City
[illegible] Robinson	M.C.
[illegible]	M.C
[illegible]	M.C
[illegible]	Miles City

NAME	~~ADDRESS~~ City
[illegible]	Miles City
[illegible]	Kinsey
[illegible]	Kinsey
[illegible]	Miles City
[illegible]	Miles City
Al Young	Ismay
[illegible]	Ismay
[illegible]	[illegible]
[illegible] Young	[illegible]
[illegible]	Ismay
[illegible]	Forsyth
[illegible]	Miles City
[illegible]	Miles City
[illegible]	Miles City
[illegible]	
Dwight W [illegible]	Miles City

SITE SELECTION MEETING

MILES CITY, MONTANA 59301
February 21, 1974

We, the undersigned, believe the Weather Modification Research Program known as "Project Skywater" to be of possible future benefit to our area and to our agricultural economy.

We, therefore, give our support to this project.

NAME	City ADDRESS
Leo F Frazier	Volborg
Wm Hopkins	Ismay
Charles Oster	Ismay
[illegible] LeRoy Alexander	Miles City
[illegible]	
[illegible]	
[illegible]	
Dr. E.D. Bergeson	Miles City
[illegible]	
[illegible]	
[illegible]	
[illegible]	
[illegible]	
Archie A. Slovik	Miles City
Marcus J. Lowe	SY Ranch Miles City
Leonard W. Lowe	Miles City
Merrill E. Lowe	Miles City
[illegible]	
Don J. Cole	Miles City
J.W. Robert	M.C.
Don Tuder	Rock Springs
Robert J. Taylor	Rockspring
[illegible]	
[illegible]	
[illegible]	
[illegible]	
[illegible]	
[illegible]	

NAME	City ADDRESS
[illegible]	Miles City
Mrs. Robert [illegible]	[illegible]
John M. Cain	Miles City
Kathleen Bruce	[illegible]
Dail Pine	Miles City
Ryan C. Hedin	M.C.
Bob Brandt	Miles City
John Koch	Miles City
[illegible]	
[illegible]	
[illegible]	
Dale Olmstead	M.C.
Jim Joyce	Miles City
Martin Lyman	Miles City
SY Ranch	calves South Miles
Dorothea M. [illegible]	Clerk
Alex Sandercin	

SITE SELECTION MEETING

MILES CITY, MONTANA 59301
February 21, 1974

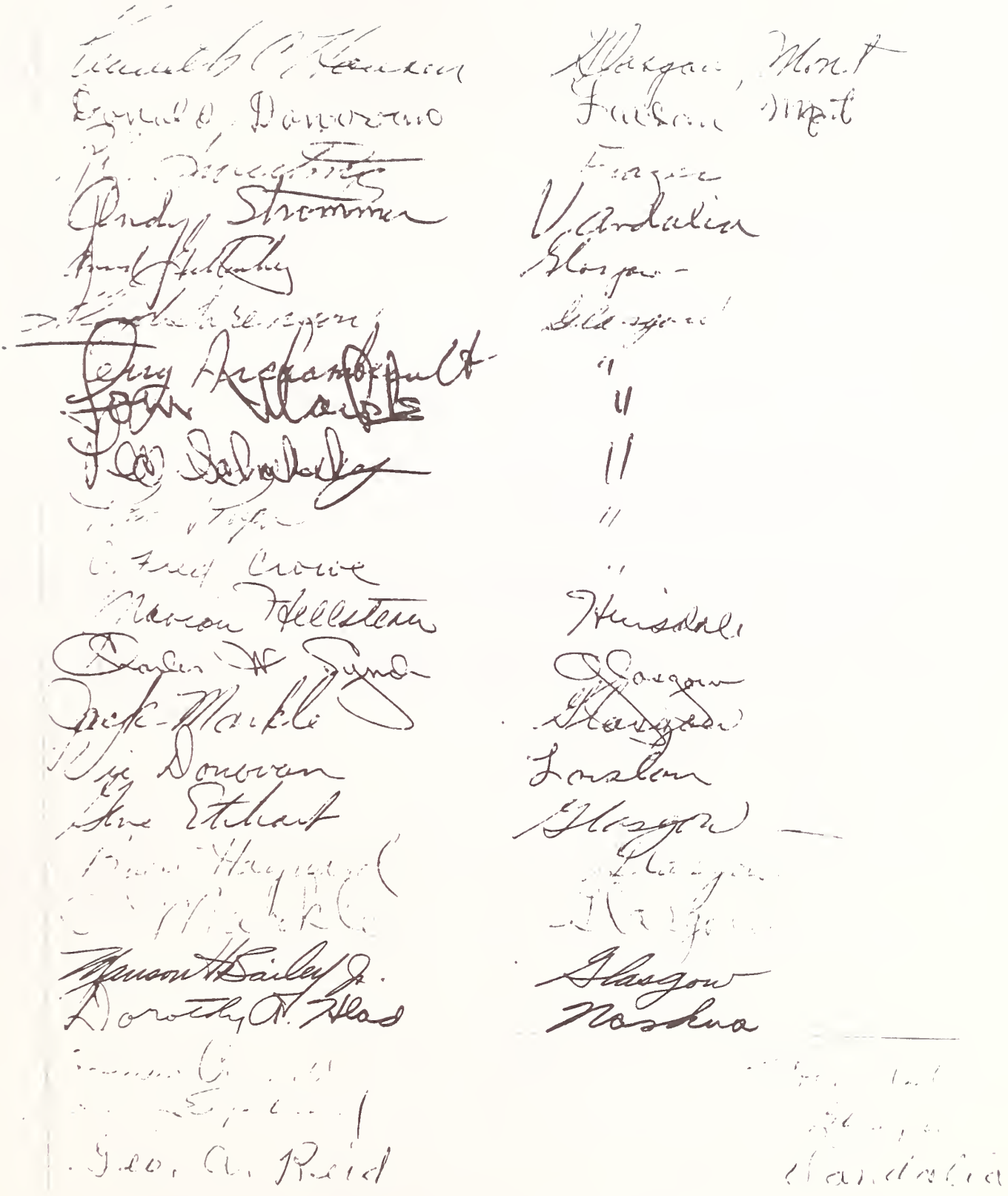
We, the undersigned, believe the Weather Modification Research Program known as "Project Skywater" to be of possible future benefit to our area and to our agricultural economy.

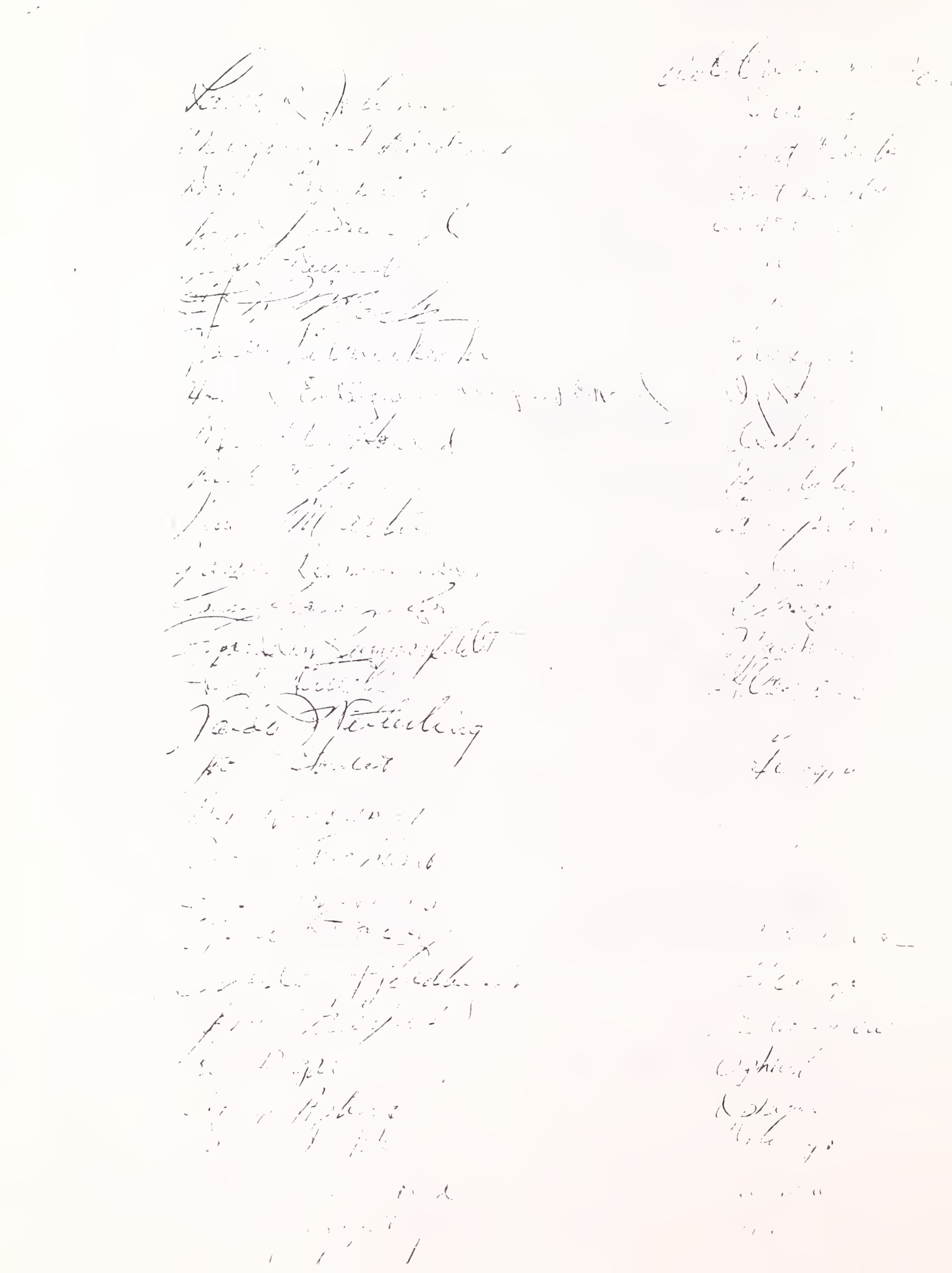
We, therefore, give our support to this project.

NAME	~~ADDRESS~~ City
[illegible]	[illegible]
Con Wolff	Miles
[illegible]	Ismay
[illegible]	[illegible]
Kenneth McEwen	Miles City
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	Ismay
[illegible]	Miles City
[illegible]	Miles City
[illegible]	Miles City
[illegible] Brown	Miles City
~~[illegible]~~	
Otto [illegible]	
[illegible]	M. C.
[illegible]	
[illegible]	M. C.
Edgar [illegible]	"
[illegible]	M. C.
[illegible]	M C
[illegible]	Forsyth
[illegible]	Powderville
[illegible]	Forsyth
[illegible]	Terry

NAME	~~ADDRESS~~ City
Vernon [illegible]	Miles City
[illegible]	Miles City
[illegible]	M C
Raymond [illegible]	Miles City

Name	Address
W P Ritter	Glasgow Mont
Susan M Coburn	"
Harry J Fuhrman	Scobey, Mont.
Larry D Sather	Scobey, Mont.
Terry Fuhrmann	Scobey Mont.
[illegible]	Scobey Mont
Clarence Fuhrman	Opheim
Gerald Hoffman	Opheim
[illegible] B. Morgan	Hero dale
[illegible]	[illegible]
Keith S. Swimm	Glasgow
Floyd Fuhrman	Scobey, Mont.
Olaf H. Gilbertson	Glasgow Mont.
Wallis E Sparks	Glasgow AFB, Mt.
[illegible]	Glasgow AFB
[illegible]	[illegible]
James Mullin	Glasgow
Patty Lind	Glasgow
Louis A. Fourn	Glasgow
Frank Eckart	Glasgow
Everett Bridgeman	Glasgow
Karl R. Buchmann	Nashua
Ellis Gleason	"
Inge Gunnarud	Nashua
C. Dahlinger	Glasgow





MONTANA QUALITY COMMODITIES, INC.

HIGH PROTEIN WHEAT · PREMIUM FEEDER CATTLE
OTHER LIVESTOCK AND FEED GRAINS

[illegible] THIRD STREET SOUTH · GLASGOW, MONTANA [illegible]

March 2, 1974

Mr. Gary J. Wicks, Director
Montana Department of Natural
Resources and Conservation
Natural Resources Building
32 South Ewing Street
Helena, Montana 59601

Thank you for your good letter of January 23 on weather modification research.

MQC officers and directors have adopted a resolution on locating the high plains cooperative weather modification research project in Montana and Glasgow, and your copy is enclosed, along with copies of a petition we positioned in a bank, a food market and two elevators for a week. These things should help.

As you know, MQC comprises key farmer, stockman and business leaders in 12 counties and is directed to agricultural development, rural business development and improvement of area economy. More rain should help gain these objectives.

We have mailed copies of our resolution to the Secretary of the Interior, Director of Bureau of Reclamation and Mr. Harold Arthur.

Sincerely,

James A. Stewart
Vice President &
General Manager

Encls: a/s

A RESOLUTION OF THE OFFICERS AND DIRECTORS OF MONTANA QUALITY COMMODITIES, INCORPORATED, URGING THE UNITED STATES BUREAU OF RECLAMATION AND MONTANA DEPARTMENT OF NATURAL RESOURCES AND CONSERVATION TO LOCATE THE HIGH PLAINS COOPERATIVE WEATHER MODIFICATION RESEARCH PROGRAM IN THE STATE OF MONTANA AND AT GLASGOW IN THE STATE OF MONTANA.

WHEREAS, climatography shows normal annual precipitation to be about fourteen and twenty-five hundredths (14.25) inches for Montana, thirteen and seventy-nine hundredths /(13.79) for Wyoming, sixteen and fifty hundredths (16.50) for North Dakota and eighteen and thirty-nine hundredths (18.39) for South Dakota, and;

WHEREAS, lesser precipitation is a major factor in causing Montana's cash receipts from agriculture to be only nine dollars and fifteen cents ($9.15) per farmland acre in the 1969 United States census of agriculture compared to seventeen dollars and thirty-seven cents ($17.37) for North Dakota and twenty-one dollars and two cents ($21.02) for South Dakota, and;

WHEREAS, lesser precipitation is a mjor factor in causing Montana, by the same census, to have thirty-eight (38) percent of its cropland in summer fallow compared to thirty-one/(31) for North Dakota, fourteen (14) for Wyoming and twelve (12) for South Dakota, and;

WHEREAS, excessive summer fallow is known to aggravate saline-alkali damage to soil, water and wildlife from dryland farming, and;

WHEREAS, this ~~more~~ arid climate is a major factor in causing Montana to put more acres under irrigation than any of these other four (4) states, and;

WHEREAS, by United States department of agriculture data, Montana could have more than six hundred and forty thousand (640,000) acres of salt-affected farmland and estimated saline-alkali damage to more than one hundred fifty thousand (150,000) acres of dry cropland, and;

WHEREAS, continued arid conditions in Montana will hinder correction of saline-alkali pollution of headwaters of major rivers for downstream users, and;

MQC RESOLUTION ON WEATHER MOD. RESEARCH (CONT'D.)

WHEREAS, increased rainfall in the greater watershed area of the headwaters state of Montana will benefit more downstream water-user states and people, and;

WHEREAS, these data should show greater need for the project to be in Montana, and;

WHEREAS, location of weather modification research in North or South Dakota can interfere with research and operations already underway in those states, and;

WHEREAS, a significant cross-section of landowners and producers in the Glasgow area have shown desire and acceptance of the program in a public meeting, and;

WHEREAS, a significant cross-section of these landowners and producers have shown acceptance and desire by petition, and;

WHEREAS, climatography for the northeastern district of Montana where Glasgow is located shows normal annual precipitation to be twelve and sixty-four hundredths (12.64) inches compared to twelve and seventy-nine hundredths (12.79) for the Miles City district, fourteen and twelve hundredths (14.12) for the Great Falls district and fourteen and forty-nine hundredths (14.49) for the Billings district, and;

WHEREAS, this lesser precipitation should show greater need, and;

WHEREAS, the Glasgow area's greater distance from mountains and its cropland-irrigation-rangeland mix makes it more representative of high plains climatology, topography and economy.

NOW, THEREFORE, BE IT RESOLVED BY THE OFFICERS AND DIRECTORS OF MONTANA QUALITY COMMODITIES:

That the United States secretary of interior, director of United States bureau of reclamation and director of Montana department of natural resources and conservation are urged to locate the high plains weather modification research program in Montana and at Glasgow in the state of Montana.

BE IT FURTHER RESOLVED, that copies of this resolution be sent to these individuals and Head Harold Arthur of the office of design and construction of United States Bureau of Reclamation.

state projects; now, 3 federal projects
& funding are scheduled for high plains. T I O N
This asks one federal project for Glasgow.

February 1974

APR - 4 1974

MONT. DEPT. OF [illegible]

We, the undersigned citizens of northeast Montana, petition herewith that the HIGH PLAINS WEATHER MODIFICATION RESEARCH PROGRAM be located in Glasgow, Montana starting in April 1975 for a five to seven year period.

We know that such research is being done in many parts of the nation and world and that this program can lead to more rain and improved water supplies, crop and livestock production, wildlife habitat, sports and tourist trade and area economy.

We believe this semi-arid location is representative of the high plains, can show greater economic need and that more rain here, could cause continuous cropping, better saline control, less pollution and more flow in the Missouri river for greater benefit to downstream users in other states.

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S.A. Ballinger	Glasgow	[illegible]	[illegible]
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ruary, 1974 PETITION FOR WEATHER RESEARCH (Cont'd)

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[illegible]	[illegible]		
Harold [illegible]	[illegible]		
[illegible]	[illegible]		
[illegible]	Glasgow		
Kenneth C Hall	Glasgow		
[illegible]	[illegible]		
[illegible] Moffitt	Glasgow		
ne R Schoonen	Hinsdale		
[illegible] Schoonen			
Ray Dahl	Glasgow		
[illegible]	Glasgow		
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R M [illegible]	[illegible]	[illegible]	
Lawrence A Combs	Glasgow	[illegible]	Glasgow
Bill [illegible]	Glasgow	[illegible]	[illegible]
Glenn R Wallem	Glasgow	[illegible]	[illegible]
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[illegible]		[illegible] Johnson	

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James [illegible]	"	Earl E. [illegible]	Lawton
[illegible]	[illegible]	[illegible]	[illegible]
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Ted [illegible]	[illegible]	LeRoy [illegible]	
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Jack [illegible]			
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Anthony [illegible]			
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NAME	ADDRESS	NAME	ADDRESS
Bill Potts	Glasgow Mont		
Otto Dahl	Opheim Mont		
[illegible]	Glasgow, Mont		
[illegible]	Glasgow Mont		
Donald R. Weil	Glasgow		
Les Skillerud	RICHLAND		
Arthur [illegible]	Glasgow Mont		
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APPENDIX G

1967 Montana Weather Modification Act

1967
MONTANA
WEATHER MODIFICATION ACT

CHAPTER 3—WEATHER MODIFICATION ACTIVITIES

Section 89-310. Definitions.
89-311. Montana water resources board responsible for administration—expenses of members.
89-312. Acquisition of property—acceptance and expenditure of funds—research and development authority.
89-312.1. Standards for research in weather modification control.
89-313. License and permit required for weather modification and control.
89-314. Board to review applications—exemptions.
89-315. Issuance of license—qualifications of licensees.
89-316. Term of license—renewal.
89-317. License fee.
89-318. Issuance of permits—requirements for permit—hearing.
89-319. Separate permit for each operation.
89-320. Notice of intention to apply for permit—activities limited by terms of permit.
89-321. Contents of notice of intention.
89-322. Publication of notice of intention.
89-323. Proof of financial responsibility by applicant.

89-324. Permit fee—time of payment.
89-325. Account in agency fund—fees used to pay expenses.
89-326. Records of operations maintained by licensees.
89-327. Reports of operations.
89-328. Records and reports open to public.
89-329. Termination of licenses and permits by board.
89-330. State and agents not liable for acts of private persons.
89-331. Violation as misdemeanor—continuing violations.

89-301 to 89-309. (349.54 to 349.62) Repealed.

Repeal

These sections (Secs. 1 to 9, Ch. 176, L. 1935), relating to development of state resources by the state planning board, were repealed by Sec. 10, Ch. 19, Laws 1967.

89-310. **Definitions.** As used in this act unless the context clearly indicates otherwise:

(1) "Weather modification and control" means changing or controlling, or attempting to change or control, by artificial methods, the natural development of any or all atmospheric cloud forms or precipitation forms which occur in the troposphere.

(2) "Research and development" means theoretical analysis, exploration and experimentation, and the extension of investigative findings and theories of a scientific and technical nature into practical application for experimental and demonstration purposes, including the experimental production and testing of models, devices, equipment, materials, and processes.

(3) "Department" means the department of natural resources and conservation, as provided in Title 82A, chapter 15.

History: En. Sec. 1, Ch. 20, L. 1967; amd. Sec. 1, Ch. 368, L. 1973.

Amendments

The 1973 amendment divided the former language into the preliminary clause and subdivision (1); and added subdivisions (2) and (3).

Title of Act

An act to control weather modification activities and designating the state water conservation board as the agency to administer this act.

89-311. **Montana water resources board responsible for administration—expenses of members.** The state water conservation board, hereafter referred to as the "board," is the state agency responsible for administration of this act. Members of the board shall receive no compensation for the performance of their duties under the provisions of this act but shall be reimbursed for expenses necessarily incurred.

History: En. Sec. 2, Ch. 20, L. 1967.

Cross-References

Water resources board, formerly the state water conservation board, abolished and functions transferred, sec. 82A-1505 (1).

89-312. **Acquisition of property—acceptance and expenditure of funds—research and development authority.** In addition to any other acts authorized by law the department may:

(1) acquire materials, equipment and facilities as are necessary to perform its duties under this act;

(2) receive any funds which may be offered or become available from federal grants or appropriations, private gifts, donations, bequests, or any other source and unless their use is restricted, may expend the funds for the administration of this act;

(3) make such studies and investigations, and obtain such information as the department may deem necessary in exercising its authority in the administration or enforcement of this act;

(4) co-operate with public or private agencies in the performance of the department's functions or duties and in furtherance of the purposes of this act;

(5) represent the state in any and all matters pertaining to plans, procedures or negotiations for interstate compacts relating to weather modification and control;

(6) enter into co-operative agreements with the United States government or any of its agencies, or with the various counties and cities of this state or with any private or public agencies for conducting weather modification or cloud seeding operations;

(7) act for and represent the state and the counties, cities and private or public agencies in contracting with private concerns for the performance of weather modifications or cloud seeding operations; and

(8) conduct and may make arrangements including contracts and agreements for the conduct of, research and development activities relating to:

(a) the identification and evaluation of meteorological, environmental, ecological, agricultural, economic, hydrological and sociological impacts of weather modification in Montana;

(b) the theory and development of methods of weather modification and control, including processes, materials and devices relating thereto;

(c) the utilization of weather modification and control for agricultural, industrial, commercial, recreational and other purposes;

(d) the protection of life and property during research and operational activities.

History: En. Sec. 3, Ch. 20, L. 1967; amd. Sec. 2, Ch. 368, L. 1973.

Amendments

The 1973 amendment substituted "department" for "board" in the preliminary clause; deleted subdivision (1), which authorized the establishment of advisory committees; renumbered subdivisions (2) and (3) as (1) and (2); and added subdivisions (3) through (8).

89-312.1. Standards for research in weather modification control. The department may establish by rule standards and instructions to govern the carrying out of research and development or projects in weather modification and control as it deems necessary or desirable to minimize danger to health, safety, welfare or property.

History: En. Sec. 3, Ch. 368, L. 1973.

Title of Act

An act amending sections 89-310, 89-

312, 89-314 and 89-318, R. C. M. 1947; adding new provisions broadening the scope of weather modification by authorizing more extensive research and development of weather modification.

89-313. License and permit required for weather modification and control. No person shall engage in activities for weather modification and control except under, and in accordance with, a license and a permit issued by the board authorizing such activities.

History: En. Sec. 4, Ch. 20, L. 1967.

89-314. Board to review applications—exemptions. The board shall review all applications for weather modification activities and may provide by rule for exempting from the license and permit requirements of this act:

(1) research and development, and experiments by state and federal agencies, institutions of higher learning and bona fide nonprofit research organizations and their agents;

(2) laboratory research and experiments;

(3) activities of an emergency character for protection against fire, frost, sleet, or fog; and

(4) activities normally engaged in for purposes other than those of inducing, increasing, decreasing, or preventing precipitation or hail.

History: En. Sec. 5, Ch. 20, L. 1967; amd. Sec. 4, Ch. 368, L. 1973.

Amendments

The 1973 amendment substituted "requirements of this act" for "fees" at the end of the preliminary clause; and made minor changes in style.

89-315. Issuance of license—qualifications of licensees. The license to engage in activities for weather modification and control shall be issued, in accordance with procedures and subject to conditions the board may by rule establish to effectuate the provisions of this act, to applicants who demonstrate competence in the field of meteorology to the satisfaction of the board. If the applicant is an organization, these requirements must be met by the individual who will be in charge of the operation for the applicant.

History: En. Sec. 6, Ch. 20, L. 1967.

89-316. Term of license—renewal. The license shall be issued for a period to expire at the end of the calendar year in which it is issued and, if the licensee possesses the qualifications necessary for the issuance of a new license, shall upon application be renewed at the expiration of the period.

History: En. Sec. 7, Ch. 20, L. 1967.

89-317. License fee. A license shall be issued or renewed only upon the payment to the board of one hundred dollars ($100) for the license or renewal.

History: En. Sec. 8, Ch. 20, L. 1967.

89-318. Issuance of permits—requirements for permit—hearing. (1) The permits shall be issued in accordance with procedures and subject to conditions the board of natural resources and conservation may by rule establish to effectuate the provisions of this act, only:

(a) if the applicant is licensed pursuant to this act;

(b) if sufficient notice of intention is published and proof of publication is filed as required in section 89-322 of this act;

(c) if an applicant furnishes proof of financial responsibility in an amount to be determined by the board as required in section 89-323 of this act;

(d) if the fee for the permit is paid as required in section 89-324 of this act;

(e) if the weather modification and control activities to be conducted are determined by the board to be for the general welfare and the public good;

(2) A public hearing may be held in the area to be affected by the issuance of the permit, if the department determines that such a hearing is necessary. The department may assess the permit applicant for the costs incurred by the department in holding the hearing.

History: En. Sec. 9, Ch. 20, L. 1967; amd. Sec. 1, Ch. 214, L. 1973; amd. Sec. 5, Ch. 368, L. 1973.

Compiler's Notes

This section was amended twice in 1973, once by Ch. 214 and once by Ch. 368. The amendatory acts appear to be in conflict as to the first sentence in subsection (2). Since chapter 368 is the later of the two enactments, the language of that amendment is shown above. Other provisions of the amendments do not appear to conflict and the compiler has made a composite section embodying the changes made by both amendments in the nonconflicting provisions.

Amendments

Chapter 214, Laws of 1973, designated the language in the former section as subsection (1); substituted letter designations (a) to (e) in subsection (1) for numeral designations (1) to (5); inserted "of natural resources and conservation" after "board" in the preliminary paragraph of subsection (1); substituted a new subsection (2) for a subdivision (6) reading "if the board has held an open hearing in the area to be affected as to such issuance"; and made minor changes in style. As enacted by Ch. 214, the first sentence of subsection (2) read: "The department of natural resources and conservation shall hold a public hearing in the area to be affected by the issuance of the permit, if the board determines that a hearing is necessary."

Chapter 368, Laws of 1973, substituted the first sentence of subsection (2) for the former subdivision (6) quoted above.

Effective Date

Section 2 of Ch. 214, Laws 1973 provided the act should be in effect from and after its passage and approval. Approved March 8, 1973.

89-319. Separate permit for each operation. "Operation" means the performance of weather modification and control activities entered into for the purpose of producing or attempting to produce, a certain modifying effect within one (1) geographical area over one continuing time interval not exceeding one (1) year.

History: En. Sec. 10, Ch. 20, L. 1967.

89-320. Notice of intention to apply for permit—activities limited by terms of permit. Prior to undertaking any weather modification and control activities, the applicant for a permit shall file with the board, and also have published, a notice of intention. If a permit is issued, the holder

of the permit shall confine his activities to the time and area limits set forth in the notice of intention, unless modified by the board. His activities shall conform to any conditions imposed by the board. The permit may not be sold or transferred.

History: En. Sec. 11, Ch. 20, L. 1967.

89-321. Contents of notice of intention. The notice of intention shall set forth at least the following:

(1) the name and address of the applicant;

(2) the nature, purpose, and objective of the intended operation and the person or organization on whose behalf it is to be conducted;

(3) the area in which, and the approximate time during which, the operation will be conducted;

(4) the area which is intended to be affected by the operation;

(5) the materials and methods to be used in conducting the operation.

History: En. Sec. 12, Ch. 20, L. 1967.

89-322. Publication of notice of intention. (1) The applicant shall have notice of intention, or that portion thereof including the items specified in section 12 [89-321] of this act, published at least once a week for two (2) consecutive weeks in a newspaper having a general circulation and published within any county in which the operation is to be conducted and in which the affected area is located, or, if the operation is to be conducted in more than one (1) county or if the affected area is located in more than one (1) county or is located in a county other than the one in which the operation is to be conducted, then in newspapers having a general circulation and published within each of the counties.

(2) Proof of publication, made in the manner provided by law, shall be filed by the applicant with the board sooner than the sixteenth day after the date of the last publication of the notice.

History: En. Sec. 13, Ch. 20, L. 1967.

89-323. Proof of financial responsibility by applicant. Proof of financial responsibility may be furnished by an applicant by his showing, to the satisfaction of the board, ability to respond in damages for liability which might reasonably be attached to, or result from, his weather modification and control activities.

History: En. Sec. 14, Ch. 20, L. 1967.

89-324. Permit fee—time of payment. The fee to be paid by each applicant for a permit shall be equivalent to one per cent (1%) of the estimated cost of such operation, the estimated cost to be computed by the board from the evidence available to it. The fee is due and payable to the board as of the date of issuance of the permit; however, if the applicant is able to give satisfactory security for the payment of the balance he may be permitted to commence the operation, and a permit may be issued therefor, upon the payment of not less than fifty per cent (50%) of the fee. The balance due shall be paid within three (3) months from the date of termination of the operation as prescribed in the permit.

History: En. Sec. 15, Ch. 20, L. 1967; amd. Sec. 1, Ch. 151, L. 1969.

Amendments

The 1969 amendment substituted "one per cent (1%)" for "one and one-half per cent (1½%)" in the first sentence.

89-325. Account in agency fund—fees used to pay expenses. There is established an account in the agency fund to be known as the "weather modification board account." All license and permit fees paid to the board shall be deposited in this account and used to pay the expenses of administering this act.

History: En. Sec. 16, Ch. 20, L. 1967.

89-326. Records of operations maintained by licensees. Every licensee shall keep and maintain a record of all operations conducted by him under his license and each permit, showing:

(1) the method employed;

(2) type of equipment used;

(3) kinds and amounts of material used;

(4) times and places of operation of the equipment;

(5) names and addresses of all individuals participating or assisting in the operation;

(6) any other general information as the board may require.

History: En. Sec. 17, Ch. 20, L. 1967.

89-327. Reports of operations. The board shall require written reports, in a manner as it provides, of each operation for which a permit is issued. The board shall also require reports from any organization that is exempt from license and permit requirements as provided in section 5 [89-314] of this act.

History: En. Sec. 18, Ch. 20, L. 1967.

89-328. Records and reports open to public. The records and reports in the custody of the board shall be open for public examination.

History: En. Sec. 19, Ch. 20, L. 1967.

89-329. Termination of licenses and permits by board. After notice to the licensee and a reasonable opportunity for a hearing, the board may modify, suspend, revoke, or refuse to renew, any license or permit issued if it appears that the licensee no longer possesses the qualifications necessary or if it appears that the licensee has violated any of the provisions of this act; or in the case of a modification, that it is necessary for the protection of the health or the property of any person.

History: En. Sec. 20, Ch. 20, L. 1967.

89-330. State and agents not liable for acts of private persons. Nothing in this act shall be construed to impose or accept any liability or responsibility on the part of the state, the board, or any state officials or employees for any weather modification and control activities of any private person or group.

History: En. Sec. 21, Ch. 20, L. 1967.

89-331. Violation as misdemeanor—continuing violations. A person violating any provision of this act is guilty of a misdemeanor, and a con-

tinuing violation is punishable as a separate offense for each day during which it occurs.

History: En. Sec. 22, Ch. 20, L. 1967.

Separability Clause

Section 23 of Ch. 20, Laws 1967 read "It is the intent of the legislative assembly that if a part of this act is invalid, all valid parts that are severable from the invalid part remain in effect. If a part of this act is invalid in one or more of its applications, the part remains in effect in all valid applications that are severable from the invalid applications."

CHAPTER 7—DAMS AND RESERVOIRS—CONSTRUCTION AND EXAMINATION OF

Section 89-702. Dams and dikes to be constructed in a secure manner—proceedings upon complaint of insecurity.
89-702.1. Jurisdiction of department.

89-702. (2659) Dams and dikes to be constructed in a secure manner —proceedings upon complaint of insecurity. (1) A person, association, or corporation may not construct, or cause to be constructed, a dam or dike for the purpose of accumulating, storing, appropriating, or diverting any of the waters of this state, except in a thorough, secure, and substantial manner.

(2) The department of natural resources and conservation may at any time on its own motion, and it shall, upon complaint on oath being made to the department by three (3) or more persons residing or having property in such location, that their homes or property would be in danger of destruction or damage in event of flood occurring on account of the breaking of any dam or dike of any reservoir within the state, and that they have reason to believe said reservoir is in an unsafe condition, or that it is being filled with water to such an extent as to render it unsafe, immediately examine, or cause to be examined, the reservoir. If, upon the examination, the department finds that the reservoir is unsafe, or is being filled with water to such an extent as to render it unsafe, it shall notify the county attorney of the county in which the reservoir is located, setting forth its findings, and the county attorney shall immediately take the necessary steps to abate the danger and make the structure safe.

(3) If either party is dissatisfied with the findings of the department, it may appeal to the district court of the district wherein the reservoir is located, and the court shall hear and determine the matter at the earliest practical time, subject to the right of either party to appeal as in other civil cases; however, the judgment of the department shall control until the final determination of the case.

History: Sec. 2139, Rev. C. 1907; amd. Sec. 1, Ch. 168, L. 1917; re-en. Sec. 2659, R. C. M. 1921; amd. Sec. 5, Ch. 280, L. 1965; amd. Sec. 1, Ch. 370, L. 1971; amd. Sec. 1, Ch. 209, L. 1973.

Amendments

The 1965 amendment substituted "state water conservation board" for "state engineer" in five places; and made minor changes in phraseology.

The 1971 amendment inserted "The Montana water resources board, at any time, on its own motion or" in the beginning of the second paragraph; and substituted "state water resources board" for "state water conservation board" in five places.

The 1973 amendment divided the former section into three subsections; substituted references to the department of natural resources and conservation for

APPENDIX H

Statement of Interstate Cooperation in Weather Modification In the Northern Plains

STATEMENT ON INTERSTATE COOPERATION IN WEATHER MODIFICATION IN THE NORTHERN PLAINS

Background

The Northern Plains Precipitation Management Committee is a working committee composed of the Governor's representative from the individual states of Montana, North Dakota, South Dakota, and Wyoming. The initial draft of the current statement was agreed to by members of the committee in their meeting in Denver, Colorado on 3 March 1972, following the conclusion of Skywater Conference VII, which reviewed plans for possible precipitation management programs for the northern plains. The current statement was reviewed again in December 1972, and is presented to enhance interstate cooperation in future weather modification programs in the northern plains.

THE FOLLOWING BACKGROUND FACTORS ARE NOTED:

1. With support from the Bureau of Reclamation's "Project Skywater" and other federal agencies, progress has been made in research into weather modification problems in the northern plains states. These research results underpin current widespread interest and efforts at development of weather modification for beneficial use.

2. Research results from Montana and Wyoming and elsewhere are confirming that snowpack can be increased by seeding winter clouds over mountains at the proper times.

3. Recent research has indicated that selective seeding can increase growing season precipitation from individual clouds and groups of clouds, and that silver iodide seeding can reduce hailfall in some situations. Computer models of clouds are available to aid in selection of clouds for treatment and seeding systems are available to effectively accomplish the seeding.

4. Uncertainties on the effects of cloud seeding increase with increasing size and complexity of weather systems, and continued field experiments are needed to evaluate effects of seeding on larger weather systems.

5. Success in weather modification to modify precipitation or to decrease hailfall damage has potential for a net economic benefit to the northern plains. Direct benefits in agricultural production from one inch of additional rainfall are estimated at

several bushels of grain or a hundred pounds or more of forage per acre. Preliminary estimates indicate that annual gross benefits may exceed $20 million per state.

6. Members of the committee have met or four occasions to consider problems in weather modification common to each of the several states and to discuss mechanisms for interstate coordination and cooperation. Plans for weather modification in the northern plains were reviewed at a public meeting in Rapid City in August 1971.

7. Draft plans for precipitation management programs for the northern plains were reviewed by scientists and interested individuals at Skywater Conference VII in Denver in March 1972. The consensus of the conference was that a basis exists for moving ahead toward useful application in the northern plains, but that a need for evaluation studies and for research and development will continue.

8. Programs of environmental monitoring are desirable and often necessary to identify changes, both favorable and adverse, resulting from weather modification activities, and for controlling operations.

9. Local interests in utilizing weather modification exist in each of the four northern plain states. The State of South Dakota appropriated $250,000 for an application program in weather modification for fiscal year 1973. An association of county weather modification authorities has been formed in North Dakota to promote further development of weather modification activity in that state. Interest in exploring the potential for beneficial use of weather modification is increasing in Montana and Wyoming.

IT IS CONSIDERED OPINION OF THE COMMITTEE MEMBERS THAT:

1. Research on precipitation management should continue with emphasis not only on modifying rainfall, snowfall, and hail damage, but also upon downwind effects and side effects having economic, environmental, and ecological consequences.

2. Utilization of weather modification must be based on local participation and decisions by representatives of those affected.

3. Local initiatives and funding will hasten applications of weather modification technology.

4. Federal support is necessary for research and development, and is desirable for evaluating, monitoring, and assisting weather modification programs.

5. The Bureau of Reclamation's "Project Skywater" is to be commended highly for past support of research and development of weather modification technology in the northern plains, and for cooperation in planning for long-range application programs.

6. The individual institutions and personnel that have worked to develop weather modification technology and its possible effects under contract with the Bureau of Reclamation are to be commended for their efforts. These include the state universities of Montana, North Dakota, South Dakota, and Wyoming, the Institute of Atmospheric Sciences at the South Dakota School of Mines and Technology, the South Dakota Weather Control Commission, and private businesses.

7. Each state is encouraged to proceed with the necessary planning, organization and funding arrangements to permit it to initiate and regulate such weather modification programs as are deemed desirable and appropriate for the state within the northern plains.

8. The committee members encourage interstate cooperation for further research and development on applied weather modification programs as this new technology matures.

9. This committee encourages widespread public distribution of this statement and solicits comments and suggestions.

NORTHERN PLAINS PRECIPITATION MANAGEMENT
COORDINATING COMMITTEE:

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Harold G. Vavra
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12 March 1973